ECONOMIC ANALYSIS OF THE PROPOSED RULE ON LEAD-BASED PAINT: REQUIREMENTS FOR NOTIFICATION, EVALUATION AND REDUCTION OF LEAD-BASED PAINT HAZARDS IN FEDERALLY OWNED RESIDENTIAL PROPERTY AND HOUSING RECEIVING FEDERAL ASSISTANCE; RESPONSE TO ELEVATED BLOOD LEAD LEVELS

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U.S. Department of Housing and Urban Development

January 13, 2017

Executive Summary

This economic analysis examines the costs and benefits of the Department of Housing and Urban Development (HUD) final rule to amend its Lead Safe Housing Rule (LSHR) (24 CFR 35, subparts B – R) for lead-based paint (LBP) hazard evaluation and reduction activities for federally-supported housing built before 1978. On September 1, 2016, HUD published the proposed rule[1] that is being made final concurrently with the publication of this economic analysis of the final rule, referred to as the Regulatory Impact Analysis (RIA).[2]

Specifically, the final rule formally adopts through regulation the Centers for Disease Control and Prevention's (CDC) approach to the definition of "elevated blood lead levels" in children under the age of six (6) in regard to recommending that environmental investigations of housing units be conducted. It also addresses the additional elements of the CDC guidance pertaining to assisted housing.

In regard to the discount rate used for this regulatory analysis, HUD is using both the 3 percent and the 7 percent discount rates in accordance with OMB guidance in OMB Circulars A-4, Regulatory Analysis,[3] and A-94, Guidelines and Discount Rates for Benefit-Cost Analysis of Federal Programs.[4] By presenting results using both 3 and 7 percent discount rates, HUD is providing a broad view of costs and benefits. Using a 3 percent discount rate, the RIA estimates that the present value of the stream of benefits of first-year activities for this amended rule, which changes the trigger for environmental intervention from being based on the environmental intervention blood lead level (EIBLL) to being based on the elevated blood lead level (EBLL), is about $98.96 million, while first-year costs are estimated at $29.04 million. Thus, the estimated net benefit using a 3 percent discount rate is $69.92 million. Using a 7 percent discount rate gives the estimated present value of the benefits of the rule associated with first-year activities as $32.15 million, with estimated costs remaining at $29.04 million and a net benefit of $3.11 million. Sensitivity analyses are included, in particular, addressing the sensitivity of costs and benefits with regard to the percentage of Government-supported housing units that have lead-based paint hazards and the effect on lifetime earnings and IQ of changes in blood lead levels. These analyses demonstrate that for most cases, the rule shows a net economic benefit.

See the proposed rule's preamble[5] and RIA[6] for the original LSHR, and the final rule preamble (i.e., the amendment regarding elevated blood lead levels)[7] in regard to approaches to

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[1] HUD Office of Lead Hazard Control and Healthy Homes, Requirements for Notification, Evaluation and Reduction of Lead- Based Paint Hazards in Federally Owned Residential Property and Housing Receiving Federal Assistance; Response to Elevated Blood Lead Levels (Proposed Rule), 81 FR 60304-60329 (September 1, 2016), available at https://www.regulations.gov/document?D=HUD-2016-0096-0001.

[2] Accessible through a "simple search" of www.ecfr.gov, looking within title 24 to search for 35 as the part number.

[3] https://www.whitehouse.gov/omb/circulars_a004_a-4/

[4] https://www.whitehouse.gov/omb/circulars_a094/

[5] U.S. Department of Housing and Urban Development (HUD), Final Rule on Lead-Based Paint: Requirements for Notification, Evaluation and Reduction of Lead-Based Paint Hazards in Federally-Owned Residential Property and

and progress made in reducing childhood lead poisoning. Conforming amendments and corrections to the LSHR were published on June 21, 2004.[8]

Background

Children under 6 years of age are the population at highest risk of significant adverse health effects from elevated blood lead levels. Children of this age are more vulnerable because their nervous systems are still developing. In addition, due to their body size and tendency to ingest greater amounts of lead relative to that smaller body size, children of any age tend to be more sensitive than adults are to the effects of lead exposure, notwithstanding those adults who have been occupationally exposed.[9] At levels of exposure typically observed in homes with lead paint, long term adverse health effects of elevated blood lead levels in young children can include reduced intelligence, reading and learning disabilities, impaired hearing, behavioral issues, and slowed growth.[10] This RIA only monetizes benefits for children under age 6, the target population of the LSHR and its enabling legislation, as discussed below.

Legislative Framework, Regulatory Options, and Policy Relationships

Title X of the Housing and Community Development Act of 1992, also known as the Residential Lead-Based Paint Hazard Reduction Act of 1992 (the Act), prescribes specific lead-based paint hazard evaluation and reduction activities for federally-supported housing. The requirements of Title X as implemented in the final rule vary by housing program and by year of construction and, for certain programs, by occupancy of children under age 6. The requirements for specific HUD programs are detailed in Subparts E through M of the final rule. In general, the rule requires the following types of hazard evaluation and reduction activities:

Housing Receiving Federal Assistance, 24 CFR part 35, subparts B – R, 64 FR 50140 (Sept. 15, 1999), available at https://federalregister.gov/a/99-23016.

[6] HUD, Economic Analysis of the Final Rule on Lead-Based Paint: Requirements for Notification, Evaluation and Reduction of Lead-Based Paint Hazards in Federally-Owned Residential Property and Housing Receiving Federal Assistance (Sept. 7, 1999), available at http://portal.hud.gov/hudportal/documents/huddoc?id=DOC_25478.pdf.

[7] Available in the docket for this amendment at https://www.regulations.gov/document?D=HUD-2016-0096.

[8] HUD, Requirements for Notification, Evaluation, and Reduction of Lead-Based Paint Hazards in Housing Receiving Federal Assistance and Federally Owned Residential Property Being Sold, Conforming Amendments and Corrections, 69 FR 34262, (June 21, 2004), available at https://federalregister.gov/a/04-13873.

[9] CDC, Preventing Lead Poisoning in Young Children, available at http://www.cdc.gov/nceh/lead/publications/prevleadpoisoning.pdf

[10] See, e.g., CDC, Educational Interventions for Children Affected by Lead (Apr. 2015), available at https://www.cdc.gov/nceh/lead/publications/educational_interventions_children_affected_by_lead.pdf; Mayo Clinic, Lead Poisoning: Symptoms and Causes, http://www.mayoclinic.org/diseases-conditions/lead-poisoning/symptoms-causes/dxc-20275054.

Hazard Evaluation:[11]

- Risk Assessment
  - Visual assessment for deteriorated paint
  - Dust tests (window sills and floors)
  - Soil tests
  - Nondestructive paint testing
  - Paint chip tests[12]
- Clearance and Reevaluation

Hazard Reduction:

- Paint stabilization
- Interim controls of LBP hazards on friction and impact surfaces
- Abatement of LBP hazards
- Cleanup
- Soil hazard cover or abatement.

A standardized set of six hazard evaluation requirements are specified for the dozens of HUD housing assistance programs. Some programs require a complete risk assessment, but many require only a visual assessment for deteriorated paint. Clearance testing is required after hazard reduction activities that disturb more than a minor amount of lead-based painted surfaces,[13] but hazard reevaluation (in future years) is only required for Multifamily Project-Based Assistance (Subpart H), in Public Housing (Subpart L), and for HUD-owned properties held for more than one year (Subparts F and I).

The LSHR reflects the prescriptive language of Title X, which limits the range of regulatory options that HUD could consider in implementing legislative requirements. Variations in the requirements under different Subparts, however, affect the costs and benefits associated with different options for LBP hazard evaluation and reduction. Hazard reduction activities are triggered by the identification of LBP hazards or when maintenance or rehabilitation activities that disturb paint known or presumed to be LBP:

- Paint stabilization is repairing physical defects in the substrate of a painted surface that is causing paint deterioration, removing loose paint and other material from the surface to be treated, and applying a new protective coating or paint. It is required when controlling deteriorated paint in single-family target housing that is owned by HUD (in subpart F; not covered by this rulemaking); multifamily target

[11] The LSHR allows presumption of the presence of lead-based paint and/or lead-based paint hazards without conducting the hazard evaluation. It does not allow presumption of their absence.

[12] When paint is being tested for whether it is lead-based paint, and it is deteriorated, chips of the paint must be removed and the chips analyzed by a laboratory recognized by the Environmental Protection Agency (EPA) under its National Lead Laboratory Accreditation Program for the analysis. Paint that is in good condition may be tested by paint chip testing or by a nondestructive analytical method, such as X-ray fluorescence (XRF). For use under HUD and EPA programs, XRF analysis must be conducted using XRF analyzers that have a Performance Characteristics Sheet (PCS) issued by HUD, and used as prescribed in the PCS.

[13] 24 CFR 35.1350(d), De minimis levels.

housing receiving project-based rental assistance (PBRA) up to $5,000 per unit per year (under subpart H of the rule), target housing for which grantees are receiving assistance for acquisition, leasing, support services, or operation (subpart K; not covered by this rulemaking), or housing for which tenants are receiving housing choice vouchers (subpart M).

- Interim controls of LBP hazards are measures designed to temporarily reduce exposure or likely exposure to LBP hazards, e.g., repairing, painting, containing, conducting specialized cleaning, removing and/or covering bare soil (soil or sand not covered by grass, sod, other live ground covers, wood chips, gravel, artificial turf, or similar covering)[14] if lead levels are hazardous,[15] conducting clearance if the amount of paint involved is more than minor,[16] implementing ongoing lead-based paint maintenance activities, establishing and operating management and resident education programs. They are required when known or presumed LBP is deteriorated and the assistance is multifamily mortgage insurance for target housing built before 1960 (subpart G; not covered by this rulemaking), PBRA for multifamily target housing receiving over $5,000 per unit per year (in subpart H), and HUD-owned multifamily target housing (subpart I), and for rehabilitation of target housing receiving over $5,000 and up to $25,000 per unit in rehabilitation assistance (in subpart J; not covered by this rulemaking).
- Abatement of LBP hazards (permanently[17] is required for rehabilitation of target housing receiving over $25,000 per unit in rehabilitation assistance (in subpart J; not covered by this rulemaking).
- Abatement of LBP is required for multifamily mortgage insurance for conversions of non-residential properties to residential, and major rehabilitations of existing residential properties (in subpart G; not covered by this rulemaking), and for comprehensive modernization of public housing (in subpart L).

Hazard controls on friction and impact surface work are required when window or floor dust levels fail the respective dust-lead hazard standards[18] and friction surface hazards (e.g., tight fitting doors or windows with LBP) or impact surface hazards (e.g., painted stair tread, doors hitting a LBP-painted wall) are present. Cleanup of friction and impact surfaces is required when dust lead level exceeds the dust-lead hazard standards, and work area cleanup is required after any hazard reduction activities (e.g., paint stabilization, interim controls, abatement).

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[14] 24 CFR 35.110.

[15] 24 CFR 35.1320(b)(2)(ii).

[16] 24 CFR 35.1350(d), i.e., 20 square feet on exterior surfaces, 2 square feet in any one interior room or space, or 10 percent of the total surface area on an interior or exterior type of component with a small surface area (e.g., window sills, baseboards, and trim).

[17] Forever or at least for a design life of 20 years (see the definition of abatement in 24 CFR 35.110).

[18] 24 CFR 35.1320(b)(2)(i).

The LSHR addresses lead poisoning in children under 6 years old living in certain HUD-owned and assisted target housing and certain other federally-owned and assisted target housing in accordance with guidance from CDC at the time of issuance of the LSHR.

The Department's primary focus in the LSHR is on prevention of childhood lead poisoning, not on case management of children who have already been poisoned. Title X specifically calls for the identification and correction of hazards in all HUD-assisted target housing, and the LSHR requires this with requirements reflecting Title X's categorization of types of federal housing assistance. The lead safety requirements for the categories of housing assistance are provided in subparts C, D, and F – M of the LSHR.[19]

In this RIA, HUD is estimating the benefits and costs associated with its proposing to change the LSHR from using HUD's currently codified environmental intervention blood lead level (EIBLL) in such children, the CDC's guidance on environmental intervention issued in 1997, shortly before the LSHR was published, to the elevated blood lead level (EBLL) defined in the proposed rule. These terms are described as follows:

- An EIBLL is "a confirmed concentration of lead in whole blood equal to or greater than 20 μg/dL (micrograms of lead per deciliter) for a single test or of 15-19 μg/dL in two tests taken at least 3 months apart" (24 CFR 35.110, Definitions).

- An EBLL value approach would be (in amended section 35.110) "a confirmed concentration of lead in whole blood of a child under age 6 equal to or greater than the concentration in the most recent guidance published by the Department of Health and Human Services on recommending that an environmental intervention be conducted." As of the publication of this rule, CDC's guidance is that an environmental intervention be conducted

[19] These subparts, based on the type of housing assistance, are as follows:

Subpart C - Disposition of Residential Property Owned by a Federal Agency Other Than HUD
Subpart D - Project-Based Assistance Provided by a Federal Agency Other Than HUD
Subpart F - HUD-Owned Single Family Property
Subpart G - Multifamily Mortgage Insurance
Subpart H - Project-Based Rental Assistance
Subpart I - HUD-Owned and Mortgagee-in-Possession Multifamily Property
Subpart J - Rehabilitation
Subpart K - Acquisition, Leasing, Support Services, or Operation.
Subpart L - Public Housing Programs
Subpart M - Tenant-Based Rental Assistance

In addition, the LSHR includes subparts B and R, as follows:

Subpart B - General Lead-Based Paint Requirements and Definitions for All Programs
Subpart R - Methods and Standards for Lead-Based Paint Hazard Evaluation and Hazard Reduction Activities

Subpart E is reserved for possible future rulemaking on single-family housing covered by HUD mortgage insurance; the requirements at 24 CFR part 200, subpart O, currently apply to such housing. Subparts N – Q are reserved for possible future rulemaking should HUD programs for target housing not covered by the current subparts be created.

when the child's blood lead level is at or above their reference range value for children under age 6; its numerical value is 5 µg/dL.[20]

CDC adopted the reference range value approach in responding to its Advisory Committee on Childhood Lead Poisoning Prevention (ACCLPP), a committee of experts that had provided scientific and technical advice related to the prevention of childhood lead poisoning to it and the Department of Health and Human Services.[21] CDC expects to update the EBLL value quadrennially.[22] The purpose of this rulemaking is to bring HUD's requirements into alignment with CDC guidance in regard to environmental investigations for cases of elevated blood lead levels in children under age six (6), while placing the minimum necessary burden on assisted property owners and other designated parties. To do so, while also maximizing the effectiveness of environmental investigations and remedial actions taken as a result of those investigations, HUD proposed that the EBLL under this rule would be a confirmed blood lead level at least that for which U.S. Department of Health and Human Services recommends (in practice, expected to be based on CDC recommendations) that an environmental intervention be conducted. This level may be the CDC's reference range value, as it is at the publication of this rule, or it could be higher, if CDC found recommending environmental interventions to be appropriate only at a higher level than the reference range value. HUD will, after public notice for comment, decide whether to maintain or revise its implementation of the LSHR to reflect the changed value, and will publish a Federal Register notice on any such revision.

Cost-Benefit Analysis Methodology

The analysis of net benefits in the RIA reflects costs and benefits associated with the units affected during the first year of hazard evaluation and reduction activities under the final rule. These costs and benefits include the present value of future benefits associated with first-year hazard reduction activities. The benefits from costs expended for first-year activities include the present value of lifetime earnings benefits for children living in the affected unit during the first year. Whether that child continues living in that unit during the second and subsequent years after hazard reduction activities does not affect the benefit calculation because the lowered lead exposure benefits all children under age 6 who reside there during the effective period of the hazard control measures (as noted above, typically 6 or 12 or more years).

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[20] CDC. CDC Response to Advisory Committee on Childhood Lead Poisoning Prevention Recommendations, in "Low Level Lead Exposure Harms Children: A Renewed Call of Primary Prevention," Atlanta (June 7, 2012), (Erratum corrected), www.cdc.gov/nceh/lead/acclpp/cdc_response_lead_exposure_recs.pdf.

[21] CDC Advisory Committee on Childhood Lead Poisoning Prevention, Low Level Lead Exposure Harms Children: A Renewed Call for Primary Prevention, Atlanta (Jan. 4, 2012), www.cdc.gov/nceh/lead/acclpp/final_document_030712.pdf.

[22] CDC. CDC Response to Advisory Committee on Childhood Lead Poisoning Prevention Recommendations. Op. cit.

Similarly, the costs of ongoing lead-based paint maintenance in units covered by this rulemaking are not considered in this analysis because they are already required by the original LSHR for housing proposed to be covered by this rulemaking.[23, 24]

The present value of lifetime earnings benefits is particularly sensitive to discount rate assumptions in the analysis because these benefits reflect lifetime earnings many decades into the future. The RIA presents estimated benefits using two different discount rates for lifetime earnings -- 3 percent and 7 percent.

HUD is using both the 3 percent and the 7 percent discount rates in accordance with OMB guidance in OMB Circulars A-4, Regulatory Analysis,[25] and A-94, Guidelines and Discount Rates for Benefit-Cost Analysis of Federal Programs.[26]

The methodology used in this analysis to estimate annual costs and benefits for the final rule is based on the following simple formulas:

Regulatory Costs = (unit cost) x (unit cost frequency) x (number of affected units [i.e., units in which environmental intervention is conducted]); and

Regulatory Benefits = (unit benefit) x (unit benefit frequency) x (number of affected units).

The unit cost estimates reflect the average costs associated with specific hazard evaluation and reduction activities in a single housing unit. The unit benefit estimates are the benefits achieved by conducting hazard reduction activities in a single housing unit. Unit cost frequencies reflect the extent of required hazard evaluation activities under the final rule, and the occurrence frequencies of different lead-based paint hazards that trigger hazard reduction requirements. Unit benefit frequencies are also determined by the occurrence

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[23] Requirements for ongoing lead-based paint maintenance (24 CFR 35.1335(a)) are incorporated into several subparts of the LSHR, including all of those covered by this rulemaking. Provisions are found in subparts G (§§ 35.620(c) and 35.625; multifamily housing insurance)), H (§ 35.715(c), §§ 35.715(d)(3). and 35.720(b); HUD project-based rental assisted housing), I (§ 35.825 (HUD-owned and mortgagee-in-possession multifamily properties)), J (§ 35.9§ 35, rehabilitation under the HOME program), K (§ 35.1015(c), Acquisition, Leasing, Support Services, or Operation if the dwelling unit has a continuing, active financial relationship with a Federal housing assistance program), L (§ 35.1120(d), public housing), and M (§ 35.1220, tenant-based rental assistance).

[24] The current rule requires that landlords of assisted target housing covered by this rule to determine if those units have lead-based paint or presume that they do, and conduct ongoing lead-based paint maintenance accordingly. It is possible, as asked, that some landlords will have not made the determination and not conducted the maintenance activities. Landlords' increased awareness and monitoring as a result of the environmental investigations or risk assessments conducted under this rulemaking are not covered by this RIA, because those activities were already covered by the overall LSHR's RIA. Ideally, we would also remove from our benefits estimate any benefits associated with this increased awareness and monitoring, because these would also already have been covered by the LSHR's RIA.

[25] https://www.whitehouse.gov/omb/circulars_a004_a-4/.

[26] https://www.whitehouse.gov/omb/circulars_a094/.

frequencies of lead-based paint hazards, because benefits are realized by hazard reduction activities. The affected units, for regulatory costs and benefits, are federally assisted units affected by the final rule.

Regulatory Costs

The cost estimates used in this RIA reflect the estimated average cost per unit for LBP hazard evaluation and reduction activities in single and multifamily units affected by the proposed amendment to the LSHR.

Monetized Net Benefits

The analysis of net benefits in this RIA reflects benefits over time associated with the costs incurred in the first year of hazard evaluation and reduction activities under the final rule. The benefits of costs incurred in first year activities include the present value of lifetime earnings benefits for children living in the affected unit during that first year, and for children living in that unit during the second and subsequent years after hazard reduction activities. As discussed in the section on Non-Quantified Benefits, below, some benefits of LBP hazard reduction cannot be quantified or monetized, so the estimates included in this analysis end to represent a lower bound on the economic benefits of LBP hazard reduction.

The "unit cost" estimates reflect the average estimated costs associated with specific hazard evaluation and reduction activities in a "typical" single or multifamily housing unit affected by the proposed rule. These unit cost estimates are adapted from the economic analysis conducted for the LSHR,[27] with cost escalation since September 1999 through April 2016 of 42.50% in accordance with the Consumer Price Index – Urban (CPI-U) published by the Department of Labor, Bureau of Labor Statistics.[28] Because the complexity of environmental investigations remains significant, prices have remained high, with typical anecdotal reporting by HUD OLHCHH LHC grantees of fees in the $1000 - $1400 range per single-family unit investigated, with a modest discount expected for conducting more than one in a property. To be conservative, HUD has assumed that only one environmental investigation is conducted at a time, and that investigation costs would be about $1200 per single-family unit.

Table 1 presents estimated average costs for lead-based paint hazard evaluation hazard reduction activities.

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[27] HUD, Economic Analysis of the Final Rule on Lead-Based Paint: Requirements for Notification, Evaluation and Reduction of Lead-Based Paint Hazards in Federally Owned Residential Property and Housing Receiving Federal Assistance, Washington (September 7, 1999), http://portal.hud.gov/hudportal/documents/huddoc?id=DOC_25478.pdf.

[28] Department of Labor, Bureau of Labor Statistics, CPI Detailed Report – Data for April 2016, Washington (2016), Table 24, Historical Consumer Price Index for All Urban Consumers (CPI-U): U.S. city average, all items. pp. 72 – 75, see, esp. p. 74, www.bls.gov/cpi/cpid1604.pdf. For April 2016 and September 1999 (when the LSHR was published), the CPI-U values were 239.261 and 167.9, respectively; their ratio is 1.4250; when rounded for calculating the increase to the four significant figures of the less precise of the two values (values were given to tenths through 2006, and since, to thousandths), this is a 42.50% increase.

As with the current LSHR, detailed in the economic analysis for its original rulemaking, relocation costs are not included for most units for which control work is required, because HUD expects that relocation of occupants will rarely be required as a result of the proposed regulations. Most interim controls can be conducted without relocation by carefully containing dust to work areas and keeping occupants out of work areas.[29] Nevertheless, this RIA for the final rule does consider temporary relocation costs for the small fraction of families for whom interim controls work will take longer than five calendar days.

"Unit cost frequencies" reflect the extent of required hazard evaluation activities under the proposed rule and the occurrence frequencies of different lead-based paint hazards that trigger hazard reduction requirements. Occurrence frequency estimates in this analysis reflect data from HUD's American Healthy Homes Survey (AHHS), conducted in 2005-2006.[30] The Survey was a nationally representative survey of primary non-institutional residences (i.e., vacation homes, barracks, dormitories and prisons were excluded); except where noted, national average prevalence frequencies from the Survey are used.

The estimated number of units under payment pertinent to the Lead Safe Housing Rule is covered in Tables 2A and 2B, based on the annual number of HUD-owned or assisted units potentially affected by the proposed rule. The subparts covered are for Section 8 Project-Based Assistance (24 CFR part 35, subpart H), Public Housing (subpart L), and Tenant-Based Rental Assistance (subpart M). In contrast, subpart I, on HUD-Owned and Mortgagee-in-Possession Multifamily Property, is not considered in this analysis because, in practice, these properties are being sold to buyers immediately upon foreclosure as part of prepackaged sales so that HUD does not retain possession of them long enough to operate them.

As shown in table 2B (Estimated Number of Units under Payment Pertinent to the Lead Safe Housing Rule – Estimated Number of Assisted Units with Child with Elevated Blood Lead Level) and the associated discussion, below, data gathered from the FY 2011 and FY 2017 Congressional Justifications[31] for the Administration's Budget, the 2013 American Housing Survey (AHS), and the AHHS, have been used to estimate the number of housing units expected to house children under age 6 with blood lead levels at or above the elevated blood lead level that are not considered environmental intervention blood lead levels already covered by the current

[29] Interim control work is typically completed within five calendar days, with the worksite contained, and the worksite and the area within ten feet cleaned so that the family can return each day. If the work lasts longer than five calendar days, the family must be temporarily relocated. At the end if the work, the unit must pass a clearance examination before re-occupancy is allowed.

[30] The AHHS is the most recent such survey. Its results were not substantially different from the preceding survey, HUD's National Survey of Lead and Allergens in Housing, conducted in 1999-2000, so HUD considers these data applicable. As of the publication of this RIA, HUD has begun preparing to conduct the AHHS II in FY 2017-2018. Dewalt FG, Cox DC, O'Haver R, Salatino B, Holmes D, Ashley PJ, Pinzer EA, Friedman W, Marker D, Viet SM, Fraser A., Prevalence of Lead Hazards and Soil Arsenic in U.S. Housing, Journal of Environmental Health. 78(5); 22-29 (December 2015), www.neha.org/node/6429; HUD Office of Healthy Homes and Lead Hazard Control, American Healthy Homes Survey: Lead and Arsenic Findings, Washington (Apr. 2011), http://portal.hud.gov/hudportal/documents/huddoc?id=AHHS_REPORT.pdf.

[31] HUD, FY 2015 Congressional Justifications, http://portal.hud.gov/hudportal/HUD?src=/program_offices/cfo/reports/fy15_CJ.

LSHR, and that would be directly affected during the first year after promulgation. As detailed in the footnote to table 2B:

- The first data column's values of the number of units with a child < 6 years old residing come from the rightmost column of table 2A.
- The second column, adjusting the first column's number of units for housing built before 1978, is based on 2013 American Housing Survey data.
- The third data column's calculation of the number of units with children with EBLLs uses the CDC's reference range value of the highest 2.5% of the under-6-year-old children's blood lead levels, assuming, conservatively, that each housing unit has at most one such child to get a conservatively high estimate of the number of units in this column.
- The fourth data column's estimate of the number of EBLLs in the categories of assisted units is adjusted for relative prevalence of significant lead-based paint hazards in government-supported housing units compared to the national prevalence (12.3% vs. 21.9%), according to the AHHS, i.e., only 56.2% of the nationally-expected number of units.[32] Considering the 95-percent confidence interval of 3.0 to 21.6% in the AHHS's estimate of the prevalence of significant lead-based paint hazards in government-supported housing units, there is a 2.5% probability that the relative percentage of assisted units with significant lead-based paint hazards is as low as 13.7%, and a similar 2.5% probability that the relative percentage is as high as 98.6%.
- The fifth data column's estimate of the number of units with children under age 6 who have EBLLs that are not EIBLLs in the categories of assisted units avoids counting units covered by the existing LSHR's EIBLL provisions. CDC's National Surveillance Data webpage,[33] shows that, for 2010 – 2012 (the most recent reporting period for which CDC published the data), 2.01% of children with blood lead levels at or above 5 µg/dL had levels at or above 20 µg/dL. Therefore, subtracting this low prevalence (vs. subtracting the larger number of units with children having blood lead levels at or above 15 µg/dL) yields a conservatively high estimate of the number of EIBLL-adjusted units affected by the proposed amendment in index units,[34] and, thus, in index and other units.

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[32] HUD Office of Healthy Homes and Lead Hazard Control, American Healthy Homes Survey: Lead and Arsenic Findings (April 2011), http://portal.hud.gov/hudportal/documents/huddoc?id=AHHS_REPORT.pdf. Table 5-1. Comparison of Prevalence of Housing Units with Significant Lead-Based Paint (LBP) Hazards, by Selected Housing (HU) Characteristics between NSLAH (HUD's National Survey of Lead and Allergens in Housing, conducted in 1998-1999 (HUD. National Survey of Lead and Allergens in Housing, Volume I, Revision 7.1: Analysis of Lead Hazards. Prepared by Westat, Inc., for HUD, October 31, 2002.) and AHHS. (Note that, per Table 5-1, the prevalence of LBP hazards in HUs with household incomes less than $30,000 and a child under age 6 is 22.1%, but the difference between that and the national 21.9% prevalence is not significant, so the more robust, national, statistic is used conservatively.)

[33] CDC, Number of Confirmed Children by Highest Blood Lead Level (µg/dL) at or Following Confirmation (1997-2012), www.cdc.gov/nceh/lead/data/stateconfirmedbyyear_1997_2012.xlsx.

[34] In this situation, the housing unit in which the child who has an EBLL resides, with the terminology adapted from the traditional epidemiology term "index case, the case that is first reported to public health authorities." CDC. Guidelines for the Control of Pertussis Outbreaks. Centers for Disease Control and Prevention: Atlanta, GA, 2000. Chapter 11, Definitions. www.cdc.gov/pertussis/outbreaks/guide/downloads/chapter-11.pdf.

The lead-based paint hazards for which lead-safe work practices are required by the LSHR to be used when conducting hazard control work[35] are assumed to be evenly distributed between interior paint repair and treating friction and impact surfaces (based on information from HUD's lead hazard control grantees that there is considerable variation from unit to unit, with no strong pattern either way). As above, the national prevalence of housing units with lead-based paint hazards for which lead-safe work practices are required, called "significant lead-based paint hazards" in the American Healthy Homes Survey, is 21.9%, while the prevalence of significant lead-based paint hazards is 12.3% among Government-assisted housing units, with a 95-percent confidence interval of 3.0 to 21.6%.[36]

Hazard reduction costs depend upon such factors as the types of hazard found (e.g., water-damaged wall paint, door handle damage to wall paint, window sash paint abrasion, etc.), their area, etc.), local labor rates, etc. In the final rule, units in the same building as the index unit that themselves have children under age six (6) residing or expected to reside, and are covered by federal assistance are required to undergo a risk assessment and, if lead-based paint hazards are found, interim controls. Under the proposed rule, such units that are receiving tenant-based rental assistance or are receiving project-based assistance up to $5,000 per unit per year or are single family housing would have been required to conduct only a visual assessment for deteriorated paint and paint stabilization. In the final rule, per-unit hazard reduction costs for multifamily housing units are shown to be uniformly lower than they were in the proposed rule. This is because the RIA for the proposed rule did not show the significant economy-of-scale discounts that result from conducting interior repair and area cleanup work on multiple units in the same property. Clearance costs have been added to the cost estimates, as have costs for soil-lead hazard control for properties in which the index unit was receiving tenant-based rental assistance, since the proposed rule's provision for visual assessments for deteriorated paint would not have addressed evaluating soil lead levels.

The RIA for the proposed rule conservatively used the interim control cost even for the tenant-based and project based units noted just above, vs. their stabilization of deteriorated paint requirement, so requiring interim controls (a consequence of requiring risk assessments) does not change the cost estimate for these units. Similarly, the proposed rule would have allowed renovation contractors to test the deteriorated paint detected by a visual assessment for its being lead-based paint, as allowed under the EPA's Renovation, Repair, and Painting Rule; if it is not lead-based paint, then the building component does not have to be repaired using lead-safe work practices and clearance, and the cost of the ordinary paint repair becomes negligible in comparison to its being performed using lead-safe practices. The cost estimate for the RIA for the proposed rule was therefore conservatively high in assuming that the contractors would not take this option; under the final rule, the risk assessment makes this lead-based paint

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[35] Amounts of paint above the *de minimis* thresholds of 24 CFR 35.1350(d), i.e., 20 square feet on exterior surfaces, 2 square feet in any one interior room or space, or 10 percent of the total surface area on an interior or exterior type of component with a small surface area (e.g., window sills, baseboards, and trim), as shown in a footnote to Hazard reduction activities--Interim controls, above.

[36] HUD Office of Healthy Homes and Lead Hazard Control, American Healthy Homes Survey: Lead and Arsenic Findings, Table 5-1 (Apr. 2011), http://portal.hud.gov/hudportal/documents/huddoc?id=AHHS_REPORT.pdf.

determination so the cost estimate is now a best estimate rather than a conservative one, but there is no increase in the estimated cost.

Similarly, costs (and benefits) are overestimated because, while the proposed and final rules allow designated parties[37] not to conduct a risk assessment of other housing units covered by this rule, based on their either having conducted a risk assessment and conducted interim controls of identified lead-based paint hazards between the date the child's blood was last sampled and the date the owner received the notification of the elevated blood lead level, or documenting compliance with evaluation, notification, lead disclosure, ongoing lead-based paint maintenance, and lead-based paint management requirements,[38] this RIA does not account for exemptions based on such past activities.

Also, costs are overestimated by assuming that the index units all have lead-based paint hazards, whether or not the environmental investigation identifies non-lead-based paint lead hazards, so that those lead-based paint hazards are controlled as part of the response to the child's case. The benefits of the rule in regard to the index units are slightly overestimated as a result of this assumption, because not all units will have lead-based paint hazard reduction activities conducted, but some fraction of the units that do not will have lead hazards that are not lead-based paint hazards (e.g., pottery, cosmetics, drinking water, occupational take-home dust, etc.) controlled as a result of their being exposed by the environmental investigation. It should be noted that these other hazards may be identified in addition to lead-based paint hazards being identified, but their control is not considered in the benefits calculation, thus providing an underestimate.

As shown in Table 3 (Estimated Cost for Hazard Evaluation and Control of Assisted Units with Child with Elevated Blood Lead Level and Other Units in Same Building), below, the estimated total incremental cost of the proposed rule during the first year is $29.04 million for the 6,638 index units and other assisted rental units having a child under age 6, for which the cost is $19.91 million for units with an EBLL child, the average cost is $2,890 for each index unit and the common area servicing the index unit (or share of the common area cost if there is more than one unit serviced by a common area), and, for the 14,936 other units and common areas servicing those units, for which the cost is $9.13 million, the average cost is $611. Note that the number of assisted units in the property, based on the estimates of Eggers and Moumen,[39] is used to determine the number of other units with a child under age 6 residing in them (i.e., the estimated 16.88% of units given in table 2B), that will be subject to risk assessment (or visual assessment for housing choice voucher units).

Table 1--Estimated Costs per Dwelling Unit for Hazard Evaluation and Reduction Activities

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[37] The designated party is the owner or other entity (e.g., federal agency, public housing agency, tribally designated housing entity, sponsor, etc.) designated under the LSHR as responsible for complying with applicable requirements of the LSHR for the residential property or dwelling unit, as applicable. *See* 24 CFR § 35.110.

[38] *See* 24 CFR §§ 35.325(b)(2), 35.730(f)(4), 35.830(f)(3), 35.1130(f)(4), and 35.1225(f)(3).

[39] Eggers, FJ, and Moumen, F, AHS [American Housing Survey] PUF [Public Use File] Information on HUD-Assisted Rental Housing, HUD Office of Policy Development and Research, Washington, (Jan. 2014).

Unit cost activity	Cost per single family unit	Cost per Multifamily unit
Hazard evaluation		
Risk Assessment	$700	$450
Environmental Investigation	$1,200	$1,000
Clearance	$210	$170
Hazard Reduction		
Interior paint repair	$710	$460
Friction/impact work	$430	$280
Area cleanup	$110	$70
Unit cleanup	$640	$430
Soil interim control [a]	$365	$18
Soil abatement [a]	$13,850	$1,352

[a] Costs of soil-lead abatement were not estimated in the original LSHR RIA (footnote 31, above) because it occurs so infrequently. This was confirmed by the American Healthy Homes Survey (footnote 35, above), Tables 7-5, Distribution of Maximum Bare Soil Lead Concentrations in Children's Play Areas (<<0.1% $[Pb]_{soil} \geq$ 5,000 ppm), and Table 7-7, Distribution of Maximum Bare Soil Lead Concentrations in the Rest of the Yard (0.8% $[Pb]_{soil} \geq$ 5,000 ppm). For completeness, these costs are estimated here, based on the EPA lead hazards standards RIA (EPA Office of Research and Development, Economic analysis of Toxic Substances Control Act section 403: Lead-based paint hazard standards (2000), https://www.epa.gov/lead/economic-analysis-toxic-substances-control-act-section-403-lead-based-paint-hazard-standards/, with costs escalated from the 1996 base using the Consumer Price Index – Urban (footnote 32).) As per the original LSHR RIA, for soil interim control (covering soil), "The cost estimate for multifamily units is only $18 [$10, escalated per the CPI-U to June 2016] per unit, because the cost per building is spread over all of the units in the building, or approximately 20 units on average." (p. 2-28). The same logic applies to soil abatement in multifamily housing,

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Table 2A.—Estimated Number of Units under Payment Pertinent to the Lead Safe Housing Rule – Estimated Number of Assisted Units with Child under age 6

Program	Units Under Payment	Adjusted for child < 6 years old residing [c]
Public Housing [a]	1,100,000	185,724
HUD Section 8 Project-Based Assistance [a]	1,200,000	202,607
Tenant Based Assistance (net) [a]	2,200,000	371,446
USDA Section 521 Rental Assistance [b]	92,512	15,157

[a] Assistance estimates for HUD are from its FY 2017 Congressional Justifications for the assistance programs above (http://portal.hud.gov/hudportal/HUD?src=/program_offices/cfo/reports/fy17_CJ).

[b] Assistance estimate for the U.S. Department of Agriculture (USDA) is from its 2017 Explanatory Notes for Rural Housing Service's budget (www.obpa.usda.gov/29rhs2017notes.pdf), which includes data on USDA Rental Assistance under Section 521 of the Housing Act of 1949 (42 U.S.C. § 1490a). This project-based rental assistance

(PBRA) program is expected to assist 286,108 housing units in FY 2017. The demographic breakdown of these units is provided in USDA's 2014 Rural Development Multi-Family Housing Annual Occupancy Report (www.ruralhome.org/storage/documents/rd_obligations/mfh-occupancy/usda-mfh-fy14-report.pdf), which can be applied reasonably to the expected 2017 assisted stock because of the program's relative stability. About two-thirds (64%) of those units (183,165) were designated for the elderly, and thus, per Title X, exempt from the statute and, hence, the LSHR, and a tenth (10%) of those units (28,988) were receiving HUD project-based assistance, and, thus, should not be double-counted in this RIA. On a proportional basis, 92,512 USDA RA units are calculated as being not designated for the elderly and not receiving HUD PBRA ((1 - .64) * (286,108 – 28,988)).

[c] Based on 38.5% of HUD-assisted rental units having children (per Eggers, FJ, and Moumen, F., AHS [American Housing Survey] PUF [Public Use File] Information on HUD-Assisted Rental Housing, HUD Office of Policy Development and Research, Washington, (Jan. 2014).[40] Table 11: Comparison of Other Housing and Household Characteristics), and, nationally, 43.9% of units with children having children under age 6, per Vespa, J, Lewis, JM, and Kreider, RM, America's Families and Living Arrangements: 2012. Population Characteristics, U.S. Department of Commerce, Economics and Statistics Administration, U.S. Census Bureau, P20-570 (Aug. 2013), Table 1, Households by Type and Selected Characteristics: ACS 2011, and Table 2, Multigenerational Households by Race and Hispanic Origin of Reference Person: CPS 2012.[41] The estimate of HUD-assisted rental units having children under age 6 is, thus, 38.5% times 43.9%, or 16.88%. This publication also reports that the US had 114,991,725 households, both assisted and unassisted, of which 15,342,000 (13.3%) had at least one child under age 6. The estimated prevalence of children under age 6 in HUD-assisted rental units is 26% higher than the national prevalence. (Compare this 2011-based 13.3% estimate to the 2005 AHS estimate of the overall housing stock's percentage of 15.9% of housing units having a child under age 6 years. (HUD and U.S. Department of Commerce, American Housing Survey for the United States: 2005 (Aug. 2006), and AHHS (HUD, American Healthy Homes Survey, Table 3-1, Characteristics of the National Survey Population, with Comparisons to American Housing Survey (AHS) and Current Population Survey (CPS) Estimates).)
Regarding the two programs that the USDA Section 521 Rental Assistance program supports, USDA's Section 515 tenant subsidy program and its Section 514 farm labor housing tenant subsidy program (both referring to the Housing Act of 1949), the Report identifies 204,466 households in the 404,891 households in those programs (50.5%) as having minors. Using the U.S. Census' distribution of tenants' age from its table of Annual estimates of the resident population by single year of age and sex (www.census.gov/popest/data/national/asrh/2015/files/NC-EST2015-AGESEX-RES.csv), that 32.44% of children under age 18 were under age 6 in 2014, and conservatively assuming the greatest number of households with a child less than 6 years old, i.e., assuming 1 per household, while, as noted above, excluding households also receiving HUD PBRA or units designated for the elderly, the calculation finds that 14,422 USDA-only PBRA housing units have a child under age 6. This is about 1.96% of the HUD-assisted units with a child < 6 years in the LSHR subparts covered by this rulemaking.

[40] http://portal.hud.gov/hudportal/HUD?src=/program_offices/cfo/reports/2011/main_toc.

[41] www.census.gov/prod/2013pubs/p20-570.pdf.

Table 2B.—Estimated Number of Units under Payment Pertinent to the Lead Safe Housing Rule – Estimated Number of Assisted Units with Child with Elevated Blood Lead Level

Units Under Payment [a]					
	Adjusted for child < 6 years old residing	Adjusted for child < 6 years old residing in pre-1978 housing	Est. no. EBLLs if LBPHs were as prevalent as in national housing stock	Est. no. EBLLs adjusted for relative prevalence of significant LBPHs in Government-supported housing units	Est. no. EBLLs that are not EIBLLs, adjusted for relative prevalence of significant LBPHs in Government-supported housing units
Public Housing	185,724	137,993	3,450	1,938	1,899
HUD Section 8 Project-Based Assistance	202,607	108,597	2,715	1,525	1,494
Total (Net) Rental Units Under Tenant-Based Assistance	371,446	245,898	6,147	3,452	3,383
USDA Project-Based Rental Assistance	15,157	8,124	203	114	112
Total	774,934	500,612	12,515	7,029	6,887

[a] The first data column's values of the number of units with a child < 6 y residing come from the rightmost column of table 2A.

The second data column, adjusting the first column's number of units for housing built before 1978, is based on the 2013 American Housing Survey, using that Survey's Table Creator website tool[42] to create a table of national area scope, for general housing characteristics of all occupied units, with filters for renter tenure (since the housing stock affected by the rule is rental housing), year built (to estimate pre-1978 housing), and subsidized renter status (since the housing is subsidized).[43] This table gives, using linear interpolation in the 1975-1979 housing age range to estimate the number of 1975-1977 units, which is then combined with the number of pre-1975 units to estimate the

[42] http://sasweb.ssd.census.gov/ahs/ahstablecreator.html, which is linked from the American Housing Survey's homepage, www.census.gov/programs-surveys/ahs.html.

[43] http://sasweb.ssd.census.gov/ahs/ahstablecreator.html#?s_areas=a0000&s_year=n2013&s_tableName=Table1&s_byGroup1=a4&s_byGroup2=a21&s_filterGroup1=t3&s_filterGroup2=g1

percentage of pre-1978 units. For public housing, project-based rental assisted housing, and tenant-based rental assisted housing, 74.3%, 53.6%, and 66.2%, respectively, of the housing stock was constructed before 1978.

The third data column's calculation of the number of units with children with EBLLs uses the CDC's reference range value of the highest 2.5% of the under-6-year-old children's blood lead levels, assuming, conservatively, that each housing unit has at most one such child in order to get a conservatively high estimate of the number of units in this column. Accordingly, the second data column's number is multiplied by that percentage.

The fourth data column's estimate of the number of EBLLs in the categories of assisted units is adjusted for relative prevalence of significant lead-based paint hazards in government-supported housing units according to the AHHS. Specifically, its table 5-1 (Comparison of Prevalence of Housing Units with Significant Lead-Based Paint Hazards, by Selected Housing Characteristics between NSLAH and AHHS) shows that 21.9% of housing units have significant lead-based paint hazards, while only 12.3% of government-supported units (including assistance from the federal, state, or local government) have them, i.e., only 56.2% of the nationally-expected number of units.[44] Accordingly, the third data column's number is multiplied by that percentage. Considering, as noted above, that the AHHS gave a 95-percent confidence interval of 3.0 to 21.6% in the estimate of the prevalence of significant lead-based paint hazards in government-supported housing units, the 95% confidence interval for the percentage of assisted units with significant lead-based paint hazards is 13.7 to 98.6%, and the 95% confidence interval around the central estimate of 7,029 units with children with EBLLs is 1,714 to 12,344.

The fifth data column's estimate of the number of units with children who have EBLLs who do not have EIBLLs in the categories of assisted units, so as avoid counting units with children with EIBLL, and, thus, the lead hazard evaluation and control work in those units having children with EIBLL, which are covered by the existing LSHR. CDC reported, on its National Surveillance Data webpage,[45] that, for 2010 – 2012 (the most recent reporting period for which CDC published the data), the number of confirmed children under age 6 by highest blood lead level at or following confirmation at 5 µg/dL as well as at higher levels, notably including 20 µg/dL, the higher level used in defining EIBLL under the LSHR. The lowest estimate of potential double counting (of units with a child having an EIBLL) assumes that all children tested with EIBLL had blood lead levels at or above 20 µg/dL (not at or above 15 µg/dL at least 3 months apart). For these years, an average of 2.01% of children with blood lead levels at or above 5 µg/dL had levels at or above 20 µg/dL. Conservatively, therefore, subtracting this low prevalence yields a high estimate of the number of EIBLL-adjusted units affected by the proposed amendment in index units, and, thus, in index and other units. Accordingly, the number of units in which the child has an EBLL is decreased by the (minimum) 2.01% double-counting factor (i.e., multiplied by 97.99%) to give a high estimate of the number of units in which the child has an EBLL that is not an EIBLL.[46] As a result, as discussed below, this approach generates a similarly conservative high estimate of the cost of evaluation and hazard control. Considering, as noted above, the AHHS 95-percent confidence interval in the estimate of the prevalence of significant lead-based paint hazards in government-supported housing units, the 95% confidence interval around the central estimate of 6,887 units with children with EBLLs that are not EIBLLs is 1,680 to 12,095.

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[44] HUD Office of Healthy Homes and Lead Hazard Control, American Healthy Homes Survey: Lead and Arsenic Findings (Apr. 2011), http://portal.hud.gov/hudportal/documents/huddoc?id=AHHS_REPORT.pdf, Table 5-1 Comparison of Prevalence of Housing Units with Significant Lead-Based Paint (LBP) Hazards, by Selected Housing (HU) Characteristics between NSLAH (HUD's National Survey of Lead and Allergens in Housing, conducted in 1998-1999 (HUD, National Survey of Lead and Allergens in Housing, Volume I, Revision 7.1: Analysis of Lead Hazards. Prepared by Westat, Inc., for HUD, October 31, 2002.) and AHHS. (Note that, per Table 5-1, the prevalence of LBP hazards in HUs with household incomes less than $30,000 and a child under age 6 is 22.1%, but the difference between that and the national 21.9% prevalence is not significant, so the more robust, national, statistic is used conservatively.)

[45] CDC, Number of Confirmed Children by Highest Blood Lead Level (µg/dL) at or Following Confirmation (1997-2012), www.cdc.gov/nceh/lead/data/stateconfirmedbyyear_1997_2012.xlsx.

[46] For reference, note that the CDC table showed that 4.11% of children with blood lead levels at or above 5 µg/dL in 2010-2012 had maximum levels at or above 15 µg/dL; had the corresponding multiplier (1-4.11%) been used, the result would have been the low estimate of the number of non-EIBLL EBLL units, relatively lower by 2.14%.

Table 3. — Estimated Cost for Hazard Evaluation and Control of Assisted Units with Child with Elevated Blood Lead Level and Other Units in Same Building

				Other Housing Units and their Common Areas			
Unit cost activity	Cost per Single Family Housing unit	Cost per Multi-Family Housing unit	Unit with EBLL child	Public housing	HUD Project-based	Tenant-based	USDA Project-based
Hazard evaluation							
Risk assessment	$700	$450		$450	$450	$450	$450
Environmental investigation	$1,200	$1,000	$1,200				
Cost of evaluation			$1,200	$450	$450	$450	$450
Hazard Reduction							
Interior paint repair (1/2 of units when LBPH identified)	$710	$460	$355	$230	$230	$230	$230
Friction/impact work (1/2 of units when LBPH identified)	$430	$280	$215	$140	$140	$140	$140
Area cleanup	$110	$70	$110	$70	$70	$70	$70
Unit cleanup	$640	$430	$640	$430	$430	$430	$430
Soil interim control (3.6% of units per AHHS)	$365	$18	$13	$1	$1	$1	$1
Soil abatement (0.8% of units, per AHHS)	$13,856	$1,352	$111	$11	$11	$11	$11
Clearance	$210	$135	$210	$135	$135	$135	$135
Unit cost of hazard control when LBPHs identified			$1,654	$1,016	$1,016	$1,016	$1,016
Estimated LBP hazard prevalence basis			All, in index unit	Govt.-assisted	Govt.-assisted	Govt.-assisted	Govt.-assisted
Presumed or			100.00%	12.30%	12.30%	12.30%	12.30%

				Other Housing Units and their Common Areas			
Unit cost activity	Cost per Single Family Housing unit	Cost per Multi-Family Housing unit	Unit with EBLL child	Public housing	HUD Project-based	Tenant-based	USDA Project-based
estimated LBP hazard prevalence [a]							
Weighted hazard control cost			$1,654	$125	$125	$125	$125
Evaluation & weighted hazard control cost			$2,854	$575	$575	$575	$575
HUD-assisted rental units having children under age 6 (Table 2A, footnote c)				16.88%	16.88%	16.88%	16.88%
Est. average no. of other housing units in building / complex (see Eggers & Moumen, op. cit. in Table 2A, footnote c)				25	15	5	15
Est. no. Buildings / complexes with child having EBLL (Table 2B)			6,887	1,899	1,494	3,383	112
Est. no. other units with HUD-assisted rental units having child under age 6				8,014	3,783	2,855	284
Lead hazard evaluation and control cost			$19,656,838	$4,608,123	$2,175,217	$1,641,602	$163,070
Temporary relocation cost (5% of hazard control cases, 6 days) [b]	$121.22	$121.22	$250,464	$291,421	$137,562	$103,816	$10,313
Cost for index units and other assisted rental units having child under age 6			$19,907,302	$4,899,544	$2,312,779	$1,745,418	$173,382
Total cost [c]			$29,038,426				

[a] As noted above, the AHHS' 95-percent confidence interval in the estimate of the prevalence of significant lead-based paint hazards in government-supported housing units around the central estimate of 12.3% is 3.0 to 21.6%. This yields a confidence interval in the number of EBLL cases that are not EIBLL cases, around the central estimate of 6,887, of 1,680 to 12,095 cases, with the numbers of units in each category of housing assistance adjusted proportionately. Similarly, this yields a confidence interval in the number of other assisted units with children under age 6 around the central estimate of 14,936, of 3,642 to 26,225, again with the numbers of units in each category of housing assistance adjusted proportionately. Conservatively, 100% of the index units are assumed to have lead-based paint hazards.

[b] Costs based on Statista (an Internet statistics company), "The average daily rate of the U.S. hotel industry reached 120.01 U.S. dollars in 2015." www.statista.com/statistics/195704/average-hotel-room-rate-in-the-us-since-2005/. The rate has been escalated from June 2015 to June 2016 using the CPI-U ($120.01 * (241.038 / 238.638) = $121.22).

[c] As noted above, the AHHS gives a 95-percent confidence interval of 3.0 to 21.6% around the central estimate of 12.3% in the estimate of the prevalence of significant lead-based paint hazards in government-supported housing units, so the 95% confidence interval around the central estimate of $29,038,426 for the total cost of this rule is $6,738,127 to $53,472,765.

Alternatives considered--Costs and benefits of changing the evaluation and hazard control methodologies for the Housing Choice Voucher Program:

In the proposed rule, assisted units with children under age six (6) in the property other than the index unit were to have conditions evaluated by a visual assessment for deteriorated paint, while in the final rule, a risk assessment is required in each of these units. Similarly, the final rule replaces the proposed paint stabilization requirement is replaced with an interim control requirement. Financially, moving to risk assessment and interim controls, thereby increasing the likelihood that dust-lead hazards and soil-lead hazards not identified by visual assessment will be found, yields a small net cost; however, it simultaneously yields important non-monetary benefits. Programmatically, due to the potential life-threatening consequences of childhood lead exposure, these non-monetary benefits offset any marginal monetary costs.

In terms of net costs, under the final rule, the monetary costs for evaluation increase from the $70 per housing unit for visual assessment to $450 for risk assessment in the final rule in each of the 2,855 other units to be evaluated, for a cost increase of $1.08 million. The costs for hazard control increase from $581 per unit for paint stabilization (which includes interior paint repair, cleanup and clearance, and, for projects lasting more than 5 days, temporary relocation) in each of the 12.30% of the 2,855 other units expected to have lead-based paint hazards, for a total cost of $204 thousand, to $399 thousand, based on the higher, $1138, cost per unit of interim controls (and, as needed, temporary relocation), for a hazard control cost increase of $195 thousand. Accordingly, the overall cost increase is $1.28 million.

In terms of net benefits, the American Healthy Homes Survey (AHHS) shows, that only 63.6% of homes that had lead-based paint hazards had deteriorated paint.[47] Consequently, children in homes with lead-based paint hazards but no deteriorated paint are at a higher risk when only a visual assessment is conducted and no control action is taken. As shown in Table 6,

[47] HUD, American Healthy Homes Survey, op. cit., Table 5-4.

the benefit of conducting lead-based paint hazard reduction is $817 per housing unit (= 0.35 µg/dL * $2,333/µg/dL), considering a discount rate of 3% and the central 12.3% estimate of the percentage of housing units with lead-based paint hazards. Combined with the AHHS Table 5-4 finding that 36.4% (= 1 – 63.6%) of homes with lead-based paint hazards had deteriorated paint, the missed opportunity to reduce lead-based paint hazards because only a visual assessment was done provides a missed benefit of $297 (= $817 * 1 – 63.6%) per housing unit. Conversely, moving from a visual assessment to a risk assessment yields that $297 benefit per housing unit. For the 2,855 other HCV housing units in the multifamily properties with children under age 6, the monetary benefit is $849 thousand, using a 3% discount rate, so, with the monetary cost being $1.28 million, the net monetary cost is $431 thousand, which is 0.44% of the benefit for children in all covered units at this 3% discount rate. For a 7% discount rate, a similar calculation shows the net monetary cost being $1.00 million, which is 3.12% of the benefit for children in all covered units at this discount rate. Calculations using other estimates of the percent of housing units with lead-based paint hazards give similar results.

Ultimately, however, requiring risk assessments and interim controls in non-index units furthers the programmatic goals of the Secretary and this rulemaking, by: qualitatively increasing the level of protection of the health of children under age six (6) residing in multifamily housing; ensuring HUD is responsive to the public comments it received in response to the proposed rule; and providing for consistent responses to EBLL cases across assistance programs.

Effect of the range of the estimate of the prevalence of significant lead-based paint hazards in government-supported housing units: Based on the American Healthy Homes Survey's 95-percent confidence interval of 3.0 to 21.6% in the estimate of the prevalence of significant lead-based paint hazards in government-supported housing units around the central estimate of 12.3% of units, the 95% confidence interval around the central estimate of the cost increase for the change in requirements for the tenant-based assistance program can be calculated. Assuming that the prevalence of hazards is at the low end of the confidence interval, there would be 696 other units to be evaluated; with an increased evaluation cost of $380 per unit, the program increase is $264 thousand. With, in this case, 3.0% of the other units having lead-based paint hazards, those 21 units have increased hazard control costs of $556 per unit, for a program increase of $12 thousand, and an overall increase of $276 thousand. Similarly, assuming the prevalence of hazards is at the high end of the confidence interval, there would be 5,014 other units to be evaluated; with an increased evaluation cost of $380 per unit, the program increase is $1.91 million. With, in this case, 21.6% of the other units having lead-based paint hazards, those 1,083 units have increased hazard control costs of $556 per unit, for a program increase of $602 thousand, and an overall increase of $2.51 million.

Benefits Identification and Estimation Methodology. The methodology used to estimate annual benefits for the proposed rule is based on the following formula:

Regulatory Benefits = (unit benefit) x (unit benefit frequency) x (number of affected units).

As with the identification of costs, the identification of benefits is based on the regulatory assessment in the current LSHR, with adjustments for cost of living and exclusion of activities

unaffected by this proposed rule. The "unit benefit" estimates are the average benefits per dwelling unit achieved by conducting hazard reduction activities. "Unit benefit frequencies" are determined by the occurrence frequencies of lead-based paint hazards (shown in Table 2), because benefits are realized by hazard reduction activities. The "number of affected units" is the annual number of HUD-owned or assisted units affected by the proposed rule (shown in Tables 3A and 3B).

The benefits of the proposed rule will be a combination of reducing (but not preventing) elevated blood levels for the children triggering the requirements of the rule, plus some expected benefit from the likelihood of preventing future exposures to any other children who later live in the affected units. The future benefits would depend upon the likelihood of young children occupying the unit in the future, which, per Eggers and Moumen, cited above, is 16.88% at any time, and the likelihood that the children develop elevated blood levels as a result, which, following lead hazard control using certified firms, followed by passing clearance at the level observed in HUD's lead hazard control grant programs of over 90% of clearance levels being below 10 µg/square foot, is less than 5%, based on the estimates used for the EPA's dust lead hazard standards,[48] which are also EPA's and HUD's lead abatement clearance levels and HUD's interim control clearance levels. .

The benefits of preventing elevated blood lead levels in young children have been monetized in published literature by Gould (2009) in "Childhood lead poisoning: conservative estimates of the social and economic benefits of lead hazard control;"[49] Brown (2002) in "Costs and benefits of enforcing housing policies to prevent childhood lead poisoning";[50] Schwartz (1993) in "The Societal Benefits of Reducing Lead Exposure"[51]; CDC in its "Strategic Plan for the Elimination of Childhood Lead Poisoning" (1991), and "Preventing Lead Exposure in Young Children: A Housing-Based Approach to Primary Prevention of Lead Poisoning" (2004);[52] and EPA in its regulatory impact analyses for its lead abatement certification program ("402 and 404") rule (1994), Renovation, Repair and Painting Rule (2008), and revised National Ambient Air Quality Standards for Lead (2008).[53] These sources identified increased lifetime earnings associated

[48] EPA, Lead: Identification of Dangerous Levels of Lead, Final Rule, 66 FR 1206 (Jan. 5, 2001), https://federalregister.gov/a/01-84.rts

[49] Gould E, Childhood lead poisoning: conservative estimates of the social and economic benefits of lead hazard control, Environmental Health Perspectives, (2009), 117:1162-7, www.ncbi.nlm.nih.gov/pmc/articles/PMC2717145/.

[50] Brown M.J., Costs and benefits of enforcing housing policies to prevent childhood lead poisoning, *Medical* Decision Making (2002), 22:6, 482-92 (Dec. 2002), http://mdm.sagepub.com/content/22/6/482.full.pdf.

[51] Schwartz J., Societal benefits of reducing lead exposure, Environmental Research (1994), 66(1), 105-24 (July 1994), www.sciencedirect.com/science/article/pii/S0013935184710486.

[52] See http://www.cdc.gov/nceh/lead/publications/primarypreventiondocument.pdf.

[53] EPA, National Ambient Air Quality Standards for Lead, 73 FR 66964 (Nov. 12, 2008), https://federalregister.gov/a/E8-25654.

with higher cognitive abilities, such as increased intelligence and better academic performance in schools, among the monetized benefits that are directly applicable to the analysis of the benefits from the proposed rule:

Monetized health benefits in the Schwartz, CDC, and EPA analyses included reduction in medical costs and special education costs and increased lifetime earnings.

Non-Quantified Benefits. Because many benefits of LBP hazard reduction cannot be easily quantified or monetized, such as the quality of life considerations of adolescents' and adults' dissatisfaction with lower intelligence, fewer skills, reduced education and job potential, criminal behavior,[54] unwed pregnancies,[55] etc., this RIA does not provide monetized estimates of the cognitive benefits of preventing children under age 6 from developing EBLLs. Such benefits include avoiding the costs of medical treatment for children with severe EBLLs, as well as increasing lifetime earnings associated with higher IQs for children with lower blood lead levels. In addition, blood lead levels of older children and adults living in the affected housing units would be expected to fall as a result of this rulemaking, although quantifying their blood lead changes is outside the scope of analysis for this rulemaking. Thus, for example, the following benefits of lead-based paint hazard reduction have not been estimated in monetary terms: [56]

--Improving children's stature, hearing, and vitamin D metabolism;

--Improving cognitive function of children;

--Reducing juvenile delinquency;

--Avoiding the parental and family time, expenses, and emotional costs involved in caring for poisoned children;

--Reductions in medical costs, including physician visits, laboratory testing, neuropsychological testing, and follow-up testing;

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[54] Dietrich K, Ris M, Succop P, Berger O, Bornschein R, Early exposure to lead and juvenile delinquency, Neurotoxicology and Teratology 23, 511–518 (2001), www.sciencedirect.com/science/article/pii/S0892036201001842; Nevin R., Understanding international crime trends: the legacy of preschool lead exposure, Environmental Research 104, 315–336, (2007), http://pic.plover.com/Nevin/Nevin2007.pdf.

[55] Nevin R., How lead exposure relates to temporal changes in IQ, violent crime, and unwed pregnancy, Environmental Research 83, 1–22 (2000), www.sciencedirect.com/science/article/pii/S0013935199940458.

[56] EPA Office of Research and Development, Lead effects on cardiovascular function, early development, and stature: An addendum to U.S. EPA Air Quality Criteria for Lead. EPA-600/8-83/028aF (1986), https://hero.epa.gov/hero/index.cfm/reference/download/reference_id/57576; EPA Office of Research and Development, Air quality criteria for lead: Volume I of II, EPA/600/R-05/144aF (2006), http://cfpub.epa.gov/ncea/CFM/recordisplay.cfm?deid=158823; Puzas JE, Osteotoxicology: the role of lead in bone disease, Current Opinion in Orthopaedics. 11: 360-365 (2000), http://journals.lww.com/co-ortho/Abstract/2000/10000/Osteotoxicology__the_role_of_lead_in_bone_diseases.6.aspx.

--Reductions in special education costs;

--Aesthetic improvements in housing quality; and

--Improving adult health outcomes, including cardiovascular, renal, reproductive, neurological, and immunological effects.

At-Risk Population. Based on the NHANES prevalence data, the neurotoxicological evidence, and the focus of Title X (and this rulemaking) on children under age 6, this analysis defines the principal at-risk population for lifetime earnings to be the national population of children under age 6. Some studies suggest that children aged one and two are also the principal at-risk population for special education benefits, although older children will also experience significant benefits.

Increased Lifetime Earnings.

The estimate for increased lifetime earnings reflect EPA and CDC estimates, adjusted to reflect NHANES data on the blood lead levels in young children. The analysis adopts the EPA estimate used in its economic analysis for the rulemaking for its lead-based paint hazard standards issued under Toxic Substances Control Act (TSCA) section 403 (and used by the LSHR[57]) that "the estimated value per IQ point lost is $8,346 (1995 dollars)," for earnings through age 64,[58] which, when adjusted to 2016 dollars using the U.S. Bureau of Labor Statistics' Consumer Price Index for All Urban Consumers (CPI-U)[59] (which was higher by 57.51% in April 2016 than in April 1995 (the same month in that year), increasing to 239.261 from 151.9) yields $13,146 per lost IQ point.

If a 3 percent discount rate is used, a 1-year old infant loses $9,521 in discounted lifetime earnings per lost I.Q. point; if a 7 percent discount rate is used, $3,095 per lost I.Q. point. This total represents the direct link between IQ and the wage rate; the indirect effect of IQ on educational attainment; and the indirect effect of lead exposure on labor force participation.

CDC and Schwartz, based on Schwartz' linear dose-response model, estimated that 0.245 IQ points (standard error of 0.41) are lost, on average, for each 1 µg/dL increase in a 1-year old child's blood lead level. This estimate is used because it is conservative for estimating the

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[57] 24 CFR 35.1320(b)(2).

[58] EPA Office of Research and Development, Economic analysis of Toxic Substances Control Act section 403: lead-based paint hazard standards (2000), https://www.epa.gov/lead/economic-analysis-toxic-substances-control-act-section-403-lead-based-paint-hazard-standards. "The estimated value per IQ point lost is $8,346 (1995 dollars)." p. ES-6. "PV = present value of the total sum of earnings of a male or female received between ages A and 64" p. 6-8.

[59] Department of Labor, Bureau of Labor Statistics, CPI Detailed Report – Data for April 2016, Table 24, Historical Consumer Price Index for All Urban Consumers (CPI-U): U.S. city average, all items. pp. 72 – 75, see esp. p. 74, www.bls.gov/cpi/cpid1604.pdf.

benefit of the rule. The EPA's 2008 RIA for its proposed revisions to the National Ambient Air Quality Standards for Lead[60] reaffirmed the Agency's 2006 air quality criteria document for lead in seeing steeper slopes for effects at lower blood lead levels than at higher levels, with the relationship being better represented at lower levels as log-linear rather than linear.[61] Thus, preventing a 1 µg/dL increase in a 1-year old child's blood lead level conservatively saves $2,333 ($9,521 x 0.245) in lifetime earnings discounted at 3 percent, or $758 ($3,095 x 0.245) in lifetime earnings discounted at 7 percent.

The potential benefit of increased earnings associated with blood lead reductions can be calculated by multiplying the potential blood lead decline for such young children by the value per unit of blood lead level reduction ($2,333 or $758 per µg/dL, discounted at 3 or 7 percent, respectively).

The potential blood lead reduction can be calculated by multiplying the average mean blood lead for children sensitive to cognitive losses by the total number of such at-risk children. All children under age 6 with elevated blood lead levels are considered in this analysis.

Reducing the blood lead levels of children with elevated blood lead levels (i.e., from at or above 5.0 µg/dL) in the index units to an expected level can be estimated using one of two approaches using NHANES data. The expectation can be the mean for children in low income families (specifically, those with a poverty income ratio below 1.3, reasonable for characterizing families in assisted housing), of 1.6 µg/dL, as reported by Wheeler and Brown of CDC regarding NHANES 1999–2010,[62] which represents a reduction for these children of at least 5.0 – 1.6 = 3.4 µg/dL. An alternative expectation can be the geometric mean of 2.16 µg/dL for children residing in pre-1978 homes, as reported by Dixon et al., regarding NHANES 1999–2004,[63] which represents a reduction for these children of at least 5.0 – 2.16 = 2.84 µg/dL. The reduction measures of the two analyses are not significantly different from each other, but the Wheeler and Brown data are more robust and more recent, so their expectation value of the blood lead level after hazard reduction, 1.6 µg/dL, is used rather than that of the Dixon et al. analysis.

A better estimate of the blood lead level reduction can be obtained by recognizing that not all blood lead levels of children under age 6 equal to or greater than 5 µg/dL are equal to that

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[60] EPA Office of Air Quality Planning and Standards, Regulatory Impact Analysis of the Proposed Revisions to the National Ambient Air Quality Standards for Lead (Oct. 2008). https://www3.epa.gov/ttnecas1/regdata/RIAs/finalpbria.pdf, Chapter 5.

[61] EPA, Air Quality Criteria for Lead. Washington, DC, EPA/600/R 5/144aF (2006).

[62] Wheeler W, and Brown MJ, Blood Lead Levels in Children Aged 1–5 Years — United States, 1999–2010, Morbidity and Mortality Weekly Report, 62:13, 245-248, CDC (Apr. 5, 2013), www.cdc.gov/mmwr/preview/mmwrhtml/mm6213a3.htm?s_cid=mm6213a3_e.

[63] Dixon SL, Gaitens JM, Jacobs DE, Strauss W, Nagaraja J, Pivetz T, Wilson JW, and Ashley PJ, Exposure of U.S. Children to Residential Dust Lead, 1999–2004: II, The Contribution of Lead-Contaminated Dust to Children's Blood Lead. Environmental Health Perspectives, 117(3), 468 (Mar. 2009), http://ehp.niehs.nih.gov/11918/.

level; many are higher. The best available estimate of the blood lead level distribution is from the CDC's reporting of its review of blood lead level data on children under 6 years from up to 35 states, DC and New York City).[64] Since 2010, CDC has been analyzing the data from (in >29 states, DC and New York City) on blood lead levels in the range of 5 – 14 μg/dL, to supplement its earlier (and ongoing) data for higher blood lead levels. An excerpt from the table on this reporting is below; for the ranges of 5 – 9, and 10 – 14 μg/dL, the respective geometric means of those ranges (6.7 and 11.8 μg/dL) are used to calculate a weighted average blood lead level in the 5 – 14 μg/dL range, specifically, 7.0 μg/dL. (Children with blood lead levels of 15 μg/dL or more are covered by the current LSHR, so they are not considered in this averaging.)

Table 4: Calculations Based on Excerpt from CDC Table on Number of Children Tested and Confirmed BLLs by State, Year, and BLL Group, Children < 72 Months Old

Year	Jurisdiction	Population < 72 months old	Number of Children Tested	Number of Confirmed Children by Highest Blood Lead Level (μg/dL) at or Following Confirmation		Totals and Weighted Average
				5-9 μg/dL	10-14 μg/dL	
2010		24,258,220	4,077,917	245,945	14,374	
2011	U.S. Totals	24,258,220	3,697,798	193,533	12,207	
2012		24,258,220	2,532,706	121,344	9,285	
2010-2012	Average # children in range			186,941	11,955	198,896
	Geometric mean of BLL range			6.7	11.8	
	# children * GM of range			1,254,036	141,457	1,395,494
	Weighted average BLL					7.0

Using the 7.0 μg/dL weighted average of blood lead levels in the 5 – 14 μg/dL range and the Wheeler and Brown estimate of the mean for children in low income families of 1.6 μg/dL as the level after lead-based paint hazard reduction gives a blood lead level reduction of 7.0 – 1.6 = 5.4 μg/dL.

As shown in Table 5 below, for the estimated 6,887 children in index units covered by this rule (i.e., with elevated blood lead levels that are not environmental intervention blood lead levels newly to be covered by this rulemaking (see Table 2)), and a blood lead level drop of 5.4

[64] CDC, Number of Confirmed Children by Highest Blood Lead Level (μg/dL) at or Following Confirmation (1997-2012), www.cdc.gov/nceh/lead/data/stateconfirmedbyyear_1997_2012.xlsx.

µg/dL, using a benefit rate of $2,333 per µg/dL, using a 3 percent discount rate gives a total benefit of $86.77 million; using a benefit rate of $758 per µg/dL for a 7 percent discount rate gives a total benefit for children in index units of at least $28.19 million.

Table 5: Benefit for children in index units covered by this rule

Discount rate	3%	7%
Benefit/µg/dl	$2,333	$758
Children < 6y with EBLL not EIBLL	6,887	6,887
Blood lead level drop (7.0 - 1.6 µg/dl)	5.4	5.4
Benefit for children in index units	$86,763,803	$28,189,868

As noted above, based on the AHHS's 95-percent confidence interval of 3.0 to 21.6% in the estimate of the prevalence of significant lead-based paint hazards in government-supported housing units around the central estimate of 12.3% of units, the 95% confidence interval around the central estimate of the 6,887 number of children with EBLL that is not EIBLL is 1,680 to 12,095 cases. As shown in Table 5A, the benefit for children in index units assuming the prevalence of hazards is at the low end of the confidence interval, using a 3% discount rate, is $21.16 million; with a 7% discount rate, the benefit for children in index units is $6.88 million. Similarly, as shown in Table 5B, assuming the prevalence of hazards is at the high end of the confidence interval, using a 3% discount rate, the benefit for children in index units is $152.38 million; with a 7% discount rate, the benefit for children in index units is $49.51 million.

Table 5A: Benefit for children in index units covered by this rule assuming 2.5th percentile of confidence interval in prevalence of lead-based paint hazards in government-supported housing units

Discount rate	3%	7%
Benefit/µg/dl	$2,333	$758
Children < 6y with EBLL not EIBLL, assuming 3.0% of assisted units have lead-based paint hazards	1,680	1,680
Blood lead level drop (7.0 - 1.6 µg/dl)	5.4	5.4
Benefit for children in index units	$21,163,786	$6,876,189

Table 5B: Benefit for children in index units covered by this rule assuming 97.5th percentile of confidence interval in prevalence of lead-based paint hazards in government-supported housing units

Discount rate	3%	7%
Benefit/µg/dl	$2,333	$758
Children < 6y with EBLL not EIBLL, assuming	12,095	12,095

3.0% of assisted units have lead-based paint hazards		
Blood lead level drop (7.0 - 1.6 μg/dl)	5.4	5.4
Benefit for children in index units	$152,379,261	$49,508,564

For children in other units in the building or complex with the index unit, the average potential blood lead level change in the LSHR's regulatory impact assessment can be updated to reflect results on lead-based paint hazards and floor dust prevalence, and on clearance examinations after lead hazard control work, as well as the escalated benefits from increased earnings associated with decreased lead exposures after the lead hazard control work. The results are summarized in the following table, with the bases for the estimates below.

Table 6: Benefit for children in other units

Discount rate	3%	7%
Benefit/μg/dl	$2,333	$758
Children < 6y in other assisted units	14,936	14,936
Blood lead level drop (3.32 – 2.98 μg/dl)	0.35	0.35
Benefit for children in other units	$12,195,991	$3,962,521

Based on the AHHS's 95-percent confidence interval of 3.0 to 21.6% in the estimate of the prevalence of significant lead-based paint hazards in government-supported housing units around the central estimate of 12.3% of units, the 95% confidence interval around the central estimate of 14,936 children under age 6 in other assisted units is 3,642 to 26,225. As shown in Table 6A, the benefit for children in other units assuming the prevalence of hazards is at the low end of the confidence interval, using a 3% discount rate, is $2.97 million; with a 7% discount rate, the benefit for children in other units is $0.97 million. Similarly, as shown in Table 6B, assuming the prevalence of hazards is at the high end of the confidence interval, using a 3% discount rate, the benefit for children in other units is $21.41 million; with a 7% discount rate, the benefit for children in index units is $6.96 million.

Table 6A: Benefit for children in other units, assuming 2.5th percentile of confidence interval in prevalence of lead-based paint hazards in government-supported housing units

Discount rate	3%	7%
Benefit/μg/dl	$2,333	$758
Children < 6y in other assisted units	3,642	3,642
Blood lead level drop (3.32 – 2.98 μg/dl)	0.35	0.35
Benefit for children in other units	$2,974,199	$966,328

Table 6B: Benefit for children in other units, assuming 97.5th percentile of confidence interval in prevalence of lead-based paint hazards in government-supported housing units

Discount rate	3%	7%
Benefit/µg/dl	$2,333	$758
Children < 6y in other assisted units	26,225	26,225
Blood lead level drop (3.32 – 2.98 µg/dl)	0.35	0.35
Benefit for children in other units	$21,414,229	$6,957,559

The beneficial effect for housing units covered by this rulemaking of reducing dust lead levels through interim control of lead-based paint hazards is indicated by comparing the levels after such work to the levels in housing units receiving government support. The survey by Cox et al. of clearance examinations by HUD's lead hazard control grantees[65] found that 72% of floor dust clearance results were at or below 5 µg/ft^2, 28% were above 5 µg/ft^2, 15% above 10 µg/ft^2 and 6% above 20 µg/ft^2, indicating that clearances far below the clearance (and dust-lead hazard) standard are achieved routinely. The AHHS found that 90.1% of housing units receiving government support had a maximum floor dust lead level below 10 µg/ft^2, with 9.9% greater or equal to 10 µg/ft^2, 4.6% greater or equal to 20 µg/ft^2, and less than 0.1% greater or equal to 40 µg/ft^2 (Table 6-14). The clearance results have a 50th percentile floor dust lead level of an estimated 3.5 µg/ft^2 and a 75th percentile of an estimated 5.2 µg/ft^2. The floor dust lead levels for units receiving government support have a 50th percentile maximum floor dust lead level of an estimated 5.5 µg/ft^2 and a 75th percentile of an estimated 8.3 µg/ft^2. The reduction, at the 50th percentile is estimated at 2.0 µg/ft^2, and at the 75th percentile, at 3.1 µg/ft^2. Because the lower (50th) percentile reflects the central measure of dust lead levels, it is more robust (and also has the advantage of conservativeness), and is used in this estimate.

Table 6 of the Dixon et al. analysis estimates the geometric mean blood lead level for children living in pre-1978 housing by a linear model for the logarithm of the blood lead level. Based on a floor dust-lead level of 5.5 µg/ft^2, the geometric mean blood lead level is estimated at 3.32 µg/Dl; with the post-clearance dust lead level estimated at 3.5 µg/ft^2 associated with a geometric mean blood lead level estimated at 2.98 µg/Dl. The mean decrease in blood lead levels for these children is 0.35 µg/Dl.

For the 14,936 children under age 6 in other assisted units in the buildings or complexes with index units (the sum of the numbers of units in the "Est. no. other units with HUD-assisted rental units having child under age 6" row of Table 3, above), an average blood lead level drop of 0.35 µg/dL, using a benefit rate of $2,333 per µg/Dl for a 3 percent discount rate gives a total

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[65] Cox DG et al., Lead Hazard Control Clearance Survey Final Report, QuanTech, Inc. (Oct. 2015), http://portal.hud.gov/hudportal/documents/huddoc?id=ClearanceSurvey_24Oct15.pdf.

benefit of $12.20 million; using a benefit rate of $758 for a 7 percent discount rate gives a total benefit of $3.96 million.

As shown in the table below, summing these benefits for children under age 6 with EBLLs in index units, and in other units in the building or complex that are proposed to be covered by the proposed rule indicates that the total lifetime earnings benefit of eliminating lead-based paint hazards would be $86.76 + 12.20 = $98.96 million at a 3 percent discount rate; or $28.19 + 3.62 = $32.15 million at a 7 percent discount rate.

Table 7: Benefit for children in all covered units

Discount rate	3%	7%
Benefit for index unit children	$86,763,803	$28,189,868
Benefit for children in other units	$12,195,991	$3,962,521
Benefit for children in all covered units	$98,959,794	$32,152,389

Based on the AHHS's 95-percent confidence interval of 3.0 to 21.6% in the estimate of the prevalence of significant lead-based paint hazards in government-supported housing units around the central estimate of 12.3% of units, the 95% confidence interval around the central estimates of the benefits for children in all covered units in Table 7 can be calculated. As shown in Table 7A, the benefit for children in all units assuming the prevalence of hazards is at the low end of the confidence interval, using a 3% discount rate, is $2.97 million; with a 7% discount rate, the benefit for children in other units is $0.97 million. Similarly, as shown in Table 7B, assuming the prevalence of hazards is at the high end of the confidence interval, using a 3% discount rate, the benefit for children in all covered units is $179.79 million; with a 7% discount rate, the benefit for children in all covered units is $56.47 million.

Table 7A: Benefit for children in all covered units, assuming 2.5th percentile of confidence interval in prevalence of lead-based paint hazards in government-supported housing units

Discount rate	3%	7%
Benefit for index unit children	$21,163,786	$6,876,189
Benefit for children in other units	$2,974,199	$966,328
Benefit for children in all covered units	$24,137,985	$7,842,517

Table 7B: Benefit for children in all covered units, assuming 97.5th percentile of confidence interval in prevalence of lead-based paint hazards in government-supported housing units

Discount rate	3%	7%
Benefit for index unit children	$152,379,261	$49,508,564
Benefit for children in other units	$21,414,229	$6,957,559
Benefit for children in all covered units	$173,793,491	$56,466,124

Duration of Benefits. The unit benefit estimates derived for lead dust hazard reduction and paint repair are entirely attributable to the present value of increased lifetime earnings associated with higher IQs resulting from the prevention of childhood lead poisoning among resident children under age 6. This present value represents the current worth of the current and future-years' costs and benefits, with future years' costs and benefits discounted at a specified discount rate that reflects the lower present value of future costs and benefits.[66] Therefore, a critical issue in assigning total unit benefits to specific hazard reduction activities is the expected duration of risk reductions associated with those activities.

This analysis reflects the findings of Wilson et al.[67] that the activities associated with interim controls result in significant lead dust reduction for at least 6 years. Specifically, Wilson et al. found that the lead hazard control treatments used in the HUD Lead Hazard Control Grant Program, which are those required under the LSHR and the EPA's Renovation, Repair and Painting Rule,[68] were effective at significantly reducing environmental lead levels on floors, window sills, and window troughs for at least 6 years following the intervention. A further study by the same research team of window replacement and lead hazard control under this grant program found the measures were still fully effective 12 years after the intervention.[69] Under the LSHR for the types of housing assistance covered by this rulemaking, ongoing maintenance and periodic re-evaluation of the condition of the lead-based paint and any interim controls conducted previously, which are not requirements of the Lead Hazard Control Grant Program, will tend to make controls under this rulemaking last even longer. Thus, the benefits are conservatively estimated for this assessment by using the 6-year duration of any necessary lead hazard control work.

Net Benefit Estimation. Estimated net benefits reflect the difference between the net present value of benefits associated with the costs expended in the first year of hazard evaluation and reduction activities under the proposed rule. These benefit estimates include the present value benefits from costs associated with first year hazard reduction activities (e.g., lifetime earnings benefits whether achieved initially or in the second and subsequent years after hazard reduction activities). The net benefits are summarized in the following table, with details below.

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[66] See, e.g., http://www.businessdictionary.com/definition/net-present-value-NPV.html.

[67] Wilson J, Pivetz T, Ashley P, Jacobs D, Strauss W, Menkedick J, Dixon S, Tsai H-C, Brown V, Friedman W, Galke W, Clark S, Evaluation of HUD-funded lead hazard control treatments at 6 years post-intervention, Environmental Research, 102:2, 237–248 (Oct. 2006), www.sciencedirect.com/science/article/pii/S0013935106000818.

[68] 40 CFR 745, esp. subpart E.

[69] Dixon SL, Jacobs DE, Wilson JW, Akoto JY, and Clark CS, Window replacement and residential lead paint hazard control 12 years later, Environmental Research, 113, 14-20 (Feb. 2012), www.ncbi.nlm.nih.gov/pubmed/22325333.

Table 8: Net benefit

Discount rate	3%	7%
Benefit for children in all covered units	$98,959,794	$32,152,389
Total first-year cost for all covered units	$29,038,426	$29,038,426
Net benefit	$69,921,368	$3,113,963

As noted in Table 8, the net benefits are $69.92 million using a 3 percent discount rate, i.e., a $98.96 million benefit minus a $29.04 million first year cost. Using a 7 percent discount rate, the net benefit estimate would be $3.11 million, from a $32.15 million benefit minus the $29.04 million first year cost.

Based on the AHHS's 95-percent confidence interval of 3.0 to 21.6% in the estimate of the prevalence of significant lead-based paint hazards in government-supported housing units around the central estimate of 12.3% of units, the 95% confidence interval around the central estimates of the net benefit for children in all covered units in Table 8 can be calculated. As shown in Table 8A, the net benefit for children assuming the prevalence of hazards is at the low end of the confidence interval, using a 3% discount rate, is $17.40 million; with a 7% discount rate, the benefit for children in other units is $1.10 million. Similarly, as shown in Table 8B, assuming the prevalence of hazards is at the high end of the confidence interval, using a 3% discount rate, the benefit for children in all covered units is $120.32 million; with a 7% discount rate, the benefit for children in all covered units is $2.99 million.

Table 8A: Net benefit assuming 2.5th percentile of confidence interval in prevalence of lead-based paint hazards in government-supported housing units

Discount rate	3%	7%
Benefit for children in all covered units	$24,137,985	$7,842,517
Total first-year cost for all covered units, assuming 3.0% have lead-based paint hazards	$6,738,127	$6,738,127
Net benefit	$17,399,858	$1,104,391

Table 8B: Net benefit assuming 97.5th percentile of confidence interval in prevalence of lead-based paint hazards in government-supported housing units

Discount rate	3%	7%
Benefit for children in all covered units	$173,793,491	$56,466,124
Total first-year cost for all covered units, assuming 21.6% have lead-based paint hazards	$53,472,765	$53,472,765
Net benefit	$120,320,726	$2,993,359

Sensitivity of Lifetime Earnings and IQ to Blood Lead Estimates. The monetized benefits of preventing elevated blood lead levels are entirely due to the benefits from increased lifetime earnings associated with the higher cognitive abilities of children who are prevented from being lead poisoned. Increased lifetime earnings are quantified by multiplying the amount of lifetime

earnings lost per IQ point ($9,521 using a 3 percent discount rate, or $3,095 using a 7 percent discount rate) by the average amount of IQ points lost per each 1 µg/dL increase in blood (Schwartz' 0.245-point estimate). However, this benefit is sensitive both to the dollar estimate of lifetime earnings per IQ point lost (and that estimate's chosen discount rate) and to the estimate of IQ points lost per µg/dL increase in blood lead levels. As shown in the table below, a meta-analysis by Schwartz et al.[70] estimated 0.245 IQ points lost per µg/dL increase in blood lead levels; with 0.185 point per µg/dL increase in populations that were socially disadvantaged.[71]

Table 9: Net benefits range considering meta-analysis

Discount rate	3%	7%
Benefit for children in all covered units	$98,959,794	$32,152,389
Total cost for all covered units	$29,038,426	$29,038,426
Net benefit	$69,921,368	$3,113,963
High meta-analysis factor (= 0.257/0.245)	1.049	1.049
Adjusted benefit (high meta-analysis factor)	$103,808,824	$33,727,856
Net benefit (high meta-analysis factor)	$74,770,398	$4,689,430
Low meta-analysis factor (= 0.185/0.245)	0.755	0.755
Adjusted benefit (low meta-analysis factor)	$74,714,645	$24,275,054
Net benefit (cost) (low meta-analysis factor)	$45,676,219	($4,763,372)

Substituting the high, 0.257, estimate for the overall population would increase the total benefits derived from increased lifetime earnings by 4.9 percent (because 0.257 is 104.9 percent of 0.245) to a benefit of $103.8 million, up from $98.96 million using a 3 percent discount rate, or a benefit of $33.73 million, up from $32.15 million using a 7 percent discount rate. Using the high, 0.257, figure yields a net benefit of $74.77 million for a 3 percent discount rate, and a net benefit of $4.69 million for a 7 percent discount rate. Most conservatively substituting the low, 0.185 figure for the 0.245 figure would reduce the total benefits derived from increased lifetime earnings by 24.5 percent (because 0.185 is 100 – 24.5 = 75.5 percent of 0.245) to a benefit of $74.71 million, down from $98.96 million using a 3 percent discount rate, or $24.26 million, down from $32.15 million using a 7 percent discount rate. Using the low figure yields a net benefit of $45.68 million for a 3 percent discount rate, and a net cost of $4.76 million for a 7 percent discount rate.

[70] Schwartz J, Low-level lead exposure and children's IQ: A meta-analysis and search for a threshold. Environmental Research, 65, 42–55 (Apr. 1994), www.sciencedirect.com/science/article/pii/S0013935184710206. Abstract at www.ncbi.nlm.nih.gov/pubmed/8162884.

[71] Grosse SD, Matte TD, Schwartz J, and Jackson RJ, Economic gains resulting from the reduction in children's exposure to lead in the United States, Environmental Health Perspectives, 110:6, pp. 563-569 (June 2002), www.ncbi.nlm.nih.gov/pmc/articles/PMC1240871/pdf/ehp0110-000563.pdf.

The estimates above of the IQ-blood lead relationship at low blood lead levels are conservative, indicating that the net benefit estimates above are appropriately conservative. Estimates based on populations of children with mean blood lead levels below 10 µg/dL have shown larger incremental IQ benefits from blood lead reductions. Four such studies are cited in the EPA's 2008 rulemaking for its National Ambient Air Quality Standards for Lead.[72] The greatest magnitude linear slope cited was that of Lanphear et al., who found an average effect of 2.94 IQ points per 1 µg/dL reduction in blood lead for children below 7.5 µg/dL.[73] Smaller effects were noted by Canfield et al. (1.79 IQ points/µg/dL reduction in children with blood lead levels below 5 µg/dL),[74] Téllez-Rojo et al. (1.71; children below 5 µg/dL),[75] and Bellinger and Needleman (1.56; children below 10 µg/dL).[76]

Based on the AHHS's 95-percent confidence interval of 3.0 to 21.6% in the estimate of the prevalence of significant lead-based paint hazards in government-supported housing units around the central net benefit estimate range considering meta-analysis in Table 9 can be calculated. As shown in Table 9A, the net benefit considering meta-analysis, assuming the prevalence of hazards is at the low end of the confidence interval, and assuming a high meta-analysis factor using a 3% discount rate, is $18.58 million; with a 7% discount rate, the net benefit is $1.49 million; while, assuming a low meta-analysis factor using a 3% discount rate, the net benefit is $11.49 million; with a 7% discount rate, the cost for children in other units is $0.82 million. Similarly, as shown in Table 9B, assuming the prevalence of hazards is at the high end of the confidence interval, the net benefit considering meta-analysis, assuming a high meta-analysis factor using a 3% discount rate, is $128.84 million; with a 7% discount rate, the net benefit is $5.76 million; while, assuming a low meta-analysis factor using a 3% discount rate, the net benefit is $77.74 million; with a 7% discount rate, the net cost is $10.84 million.

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[72] EPA, National Ambient Air Quality Standards for Lead, 73 FR 66964 (Nov. 12, 2008), https://federalregister.gov/a/E8-25654. See Table 3 *at* 67003.

[73] Lanphear BP, Hornung R, Khoury J, Yolton K, Baghurst P, Bellinger DC, Canfield RL, Dietrich KN, Bornschein R, Greene T, Rothenberg SJ, Needleman HL, Schnaas L, Wasserman G, Graziano J, Roberts R, Low- level environmental lead exposure and children's intellectual function: An international pooled analysis, Environmental Health Perspectives, 113: 894–899 (2005).

[74] Canfield, RL, Henderson, CR, Jr., Cory-Slechta, DA, Cox, C, Jusko, TA, Lanphear, BP, Intellectual impairment in children with blood lead concentrations below 10 µg per deciliter, N. Engl. J. Med, 348: 1517–1526 (2003).

[75] Téllez-Rojo MM, Bellinger DC, Arroyo-Quiroz C, Lamadrid-Figueroa H, Mercado-García A, Schnaas-Arrieta L, Wright R O, Hernández-Avila M, Hu H, Longitudinal associations between blood lead concentrations < 10 µg/dL and neurobehavioral development in environmentally-exposed children in Mexico City, Pediatrics 118: e323–e330 (2006).

[76] Bellinger DC and Needleman HL, Intellectual impairment and blood lead levels [letter], N. Engl. J. Med, 349: 500 (2003).

Table 9A: Net benefits range considering meta-analysis, assuming 2.5th percentile of confidence interval in prevalence of lead-based paint hazards in government-supported housing units

Discount rate	3%	7%
Benefit for children in all covered units	$24,137,985	$7,842,517
Total cost for all covered units	$6,738,127	$6,738,127
Net benefit	$17,399,858	$1,104,391
High meta-analysis factor (= 0.257/0.245)	1.049	1.049
Adjusted benefit (high meta-analysis factor)	$25,320,746	$8,226,801
Net benefit (high meta-analysis factor)	$18,582,620	$1,488,674
Low meta-analysis factor (= 0.185/0.245)	0.755	0.755
Adjusted benefit (low meta-analysis factor)	$18,224,179	$5,921,101
Net benefit (cost) (low meta-analysis factor)	$11,486,052	($817,026)

Table 9B: Net benefits range considering meta-analysis, assuming 97.5th percentile of confidence interval in prevalence of lead-based paint hazards in government-supported housing units

Discount rate	3%	7%
Benefit for children in all covered units	$173,793,491	$56,466,124
Total cost for all covered units	$53,472,765	$53,472,765
Net benefit	$120,320,726	$2,993,359
High meta-analysis factor (= 0.257/0.245)	1.049	1.049
Adjusted benefit (high meta-analysis factor)	$182,309,372	$59,232,964
Net benefit (high meta-analysis factor)	$128,836,607	$5,760,199
Low meta-analysis factor (= 0.185/0.245)	0.755	0.755
Adjusted benefit (low meta-analysis factor)	$131,214,086	$42,631,923
Net benefit (cost) (low meta-analysis factor)	$77,741,321	($10,840,841)

Blood Lead to IQ Relationship. Another uncertainty about the blood lead to IQ relationship is whether it applies at low blood lead levels. The available evidence does not indicate a no-effects level. CDC's Response to ACCLPP stated that "there is compelling evidence that low BLLs are associated with IQ deficits, attention-related behaviors, and poor academic achievement." This rulemaking is for a blood lead level for which there is ample evidence of effects.[77]

[77] See, e.g.: Agency for Toxic Substances and Disease Registry, Toxicological profile for lead, Atlanta: U.S. Department of Health and Human Services (Aug. 2007), www.atsdr.cdc.gov/toxprofiles/tp13.pdf; National Institute of Environmental Health Sciences, National Toxicology Program, NTP Monograph on Health Effects of Low-Level Lead, NIH Publication No. 12-5996 (June 13, 2012) http://ntp.niehs.nih.gov/pubhealth/hat/noms/lead/index.html; EPA Office of Research and Development, Integrated Science Assessment for Lead, Research Triangle Park, NC (June 2013), https://cfpub.epa.gov/ncea/risk/recordisplay.cfm?deid=255721 (see also Memo Regarding a Study

Hazard Education. Many hazard reduction studies reflect some amount of lead hazard education for residents, but it has been difficult to separate the benefits of hazard reduction from the benefits of hazard education. The estimated duration of dust removal benefits assumes that the baseline includes increased resident education about lead hazards, which reduces the re-accumulation of lead dust.

Benefit of changing the evaluation and hazard control methodologies for the Housing Choice Voucher Program. As noted above, in the proposed rule, assisted units with children under age 6 in the property other than the index unit were to have conditions evaluated by a visual assessment for deteriorated paint and paint stabilization, while in the final rule, a risk assessment is required in these units. Similarly, the proposed paint stabilization requirement is replaced by interim controls as are required in the final rule. As shown in Table 7, the benefit for children in all covered units under the final rule is $98.96 million, using a 3% discount rate, or $32.15 million, using a 7% discount rate. (The change in housing choice voucher program methodologies does not affect index units, which are addressed by environmental investigation and interim controls in both the proposed and final rules, so the differences are unaffected by their inclusion in these total benefit amount comparisons between the proposed and final rules.) Under the proposed rule, the benefit for children in all covered units under the final rule was $97.91 million, using a 3% discount rate, or $31.81 million, using a 7% discount rate. The incremental benefit in the final rule is $1.05 million, using a 3% discount rate, or $342 thousand, using a 7% discount rate. Considering the $1.13 million increased cost for the housing choice voucher program methodologies, there is a slight reduction in benefit, $80 thousand, using a 3% discount rate, and a small reduction in benefit, $791 thousand, using a 7% discount rate, associated with that change in methodologies. These modest reductions in the benefits are programmatically acceptable because the overall benefits for the housing choice voucher program are positive, and programmatic consistency is being obtained by requiring a risk assessment and interim controls for both index and other assisted units.

3. Economic Impacts

The economic impact analysis of which entities will bear the cost of the proposed lead-based paint hazard evaluation and reduction requirements for HUD programs is discussed below.

Project-Based and Tenant-Based Rental Assistance. For tenant-based assistance programs, the proposed rule states that the owner is responsible for paint repair and cleanup, but it may be possible for owners to raise the contract rent to finance the cost of lead-based paint hazard evaluation and reduction. Although this option is not explicitly stated in the proposed rule, it is reasonable to expect that property owners will try to recover regulatory costs, and income-based limits on tenant-paid rents under this program suggest that HUD would pay the cost of any rent increase. For the purpose of this analysis, it is assumed that HUD will directly or indirectly pay

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Assessed in the 2013 ISA for Lead (May 9, 2014), http://ofmpub.epa.gov/eims/eimscomm.getfile?p_download_id=518543).

the incremental costs of the proposed rule for tenant-based assistance programs and for project-based assistance programs.

If HUD is directly or indirectly paying the costs of the proposed rule for its rental assistance programs, then the economic impact for these programs can be measured in terms of the number of households or units that HUD would be unable to assist each year with the funds that are expended on lead-based paint hazard evaluation and reduction. Assuming, that the likelihood of an elevated blood lead level case is the same in each of HUD's assistance programs, the total annual incremental cost of the proposed rule for tenant-based and project-based assistance programs can be determined as shown in the following table, which uses data from Tables 2A and 2B, with data for the units with a child with an EBLL for a program, and data for the other units for that program merged into total amounts for that program:

Table 10: Assisted units that would be forgone if funding were from funding agency with no appropriation increase

Unit cost activity	Public housing	HUD Project-based	Tenant-based	USDA Project-based	Total
Unit cost of evaluation, and weighted hazard control and temporary relocation for index units	$2,890	$2,890	$2,890	$2,890	-
Est. no. buildings / complexes with child having EBLL	1,899	1,494	3,383	112	6,887
Cost of evaluation, hazard control and temporary relocation in index units	$5,488,777	$4,318,200	$9,776,636	$323,723	$19,907,336
Unit cost of evaluation, and weighted hazard control and temporary relocation for other units	$611	$611	$611	$611	-

Est. no. other units with assisted rental units having child under age 6	8,014	3,783	2,855	284	14,936
Cost for other assisted rental units having child under age 6	$4,899,730	$2,312,912	$1,745,536	$173,637	$9,131,815
Total cost	$10,388,506	$6,631,112	$11,522,173	$497,360	$29,039,151
Number of units with child having EBLL or other assisted rental units having child under age 6	9,913	5,277	6,237	396	21,822
Program assistance per unit	$5,849	$9,013	$9,329	$4,911	-
# assisted units that would be forgone if funding were from funding agency with no appropriation increase	1,776	736	1,235	101	3,848
Assisted housing stock	1,100,000	1,200,000	2,200,000	286,108	4,786,108
% assisted units that would be forgone if funding were from funding agency with no appropriation increase	0.161%	0.061%	0.056%	0.035%	0.080%

For public housing, the 1,899 index units require an average of $2,890 for evaluation, hazard control, and temporary relocation, for a total of $5.49 million; with the 8,014 other public housing units requiring an average evaluation, hazard control, and temporary relocation cost of $611 and a total cost of $4.90 million. The total cost for this rule for the public housing program, considering both index and other units, is $10.39 million.

For tenant-based rental assistance, the 3,383 index units require an average of $2,890 for evaluation, hazard control, and temporary relocation, for a total of $9.78 million; with the 2,855 other tenant-based rental units requiring an average evaluation, hazard control, and temporary relocation cost of $611, and a total cost of $1.75 million. The total cost for this rule for the tenant-based rental assistance program, considering both index and other units, is $11.52 million.

Similar calculations apply to HUD project-based rental assistance and USDA project-based assistance, giving their total costs for this rule of $6.63 million and $497 thousand, respectively.

Looking at the amounts appropriated for these several programs provides another approach to the effect of this proposed rule, by making the assumptions that no additional funds will be available for use by these program offices or the specific programs to support the additional costs by either increased appropriation, reapportionment, reallocation, or otherwise.

Public Housing. The annual per-household cost of this assistance requested by HUD in its FY 2017 Budget, considering both the Public Housing Operating Fund and the Public Housing Capital Fund, is $5,849.[78] Therefore, with the $10.39 million to be expended on lead-based paint hazard evaluation and reduction for public housing, if funding for this work were to come from HUD with no increase for this program, the number of assisted units to which public housing assistance would be forgone would be 1,776 units. This would represent 0.161% of the 1,100,000 households receiving public housing assistance, on average through the fiscal year.

Tenant-based rental assistance. The annual per-household cost of this assistance requested by HUD in its FY 2017 Budget is $9,329 per unit for contract renewals and administrative fees.[79] Therefore, with the $11.52 million projected to be expended on lead-based paint hazard evaluation and reduction, and temporary relocation for tenant-based assistance programs, if that funding for this work were to come from HUD with no increase for this program, the number of assisted units to which tenant-based rental assistance would be forgone would be $11.52 million / $9,329 = 1,235 units, which is 0.056% of the 2,200,000 households expected to receive tenant-based rental assistance under the FY 2017 budget, on average through the fiscal year.

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[78] HUD, Fiscal Year 2017 Budget Congressional Justification: Public and Indian Housing. The funding for public housing comes from the Public Housing Operating Fund and the Public Housing Capital Fund. The request for the Operating Fund is for $4.569 billion, to cover Public Housing Operation, and Administration and Program Implementation (http://portal.hud.gov/hudportal/documents/huddoc?id=9-Public_HSNG_OPS_Fund.pdf). The request for the Capital Fund is $1.865 billion, most of which is for formula-based Capital Modernization grants (http://portal.hud.gov/hudportal/documents/huddoc?id=10-Public_HSNG_Cap_Fund.pdf). The total of $6.434 billion would serve 1.1 million households, for an average of $5,849 per household.

[79] HUD, Fiscal Year 2017 Budget Congressional Justification: Tenant-Based Rental Assistance, http://portal.hud.gov/hudportal/documents/huddoc?id=6-Tenant-Based_Rent_Assist.pdf. The tenant-based rental assistance program request is for $18.447 billion for contract renewals, and $2.077 billion for administrative fees, for a total of $20.524 billion, to assist 2.2 million families, for an average of $9,329 per family.

HUD project-based rental assistance. The annual per-household cost of this assistance requested by HUD in its FY 2017 Budget is $9,013 per unit.[80] Therefore, with the $6.63 million to be expended on lead-based paint hazard evaluation and reduction for housing receiving project-based rental assistance, if funding for this work were to come from HUD with no increase for this program, the number of assisted units to which project based rental assistance would be forgone would be 736 units. This represents 0.061% of the 1,200,000 households expected to be served by project-based rental assistance under the FY 2017 budget, on average through the fiscal year.

USDA Section 521 Rental Assistance. The annual per-household cost of this project-based assistance requested by USDA (and authorized by Section 521(a)(2) of the Housing Act of 1949, 42 U.S.C. § 1490a(a)(2)) in its FY 2017 Budget is $4,911.[81] With an estimated $497 thousand to be expended on lead-based paint hazard evaluation, hazard control, and temporary relocation for the program, if funding for this work were to come from USDA with no increase for this program, the number of units to which assistance would be forgone would be 101 units. This would represent 0.035% of the households receiving this Section 521 assistance, on average through the fiscal year.

Overall. The direct economic impact of the proposed rule on these programs is conservatively overstated in the calculations above because it ignores direct economic benefits to owners of the children's health improvements induced by the rule as they translate into greater family stability and, thus, increased net family income after health and social services expenses are reduced, and thus, increased ability of the family's to pay their share of the rent, and decreased housing unit turnover and its associated costs to owners.

With such an understanding, a measure of the direct economic impact is the conservative estimate of the number of units which would not be assisted as a result of the increased expenditures on units covered by this rulemaking, if no additional funds were available, without any offsetting factors. Under the programs above, which are expected in FY 2017 to assist 4.79 million families, on average through the fiscal year, if no additional funding for this work were to come, and no offsetting factors were considered, an estimated 3,848 homes would not be assisted, which would be 0.080% of the housing stock assisted under these programs. Specifically, an estimated 1,776 units of public housing representing 0.16% of the projected public housing stock would not be assisted, and similarly for 736 units (0.061%) of the HUD project-based rental assisted housing stock, 1,235 units (0.056%) of housing for which families

[80] HUD, Fiscal Year 2017 Budget Congressional Justification: Housing, Project-Based Rental Assistance, http://portal.hud.gov/hudportal/documents/huddoc?id=24-Proj.Based_Rent_Assist.pdf. The project-based rental assistance program request is for $10.028 billion for renewals and $549 million for amendments, as well as $235 million for Performance-Based Contract Administration and $4 million in technical assistance for tenant organizations to assist 1.2 million families, for an average of $9,013 per family.

[81] USDA, Explanatory Notes for its Rural Housing Service, FY 2017 Congressional Justification: Rental Assistance Program, Justification of Increases and Decreases, pp. 29-42 – 29-45. (http://www.obpa.usda.gov/29rhs2017notes.pdf). USDA's Explanatory Notes for its Rural Housing Service's 2017 Congressional Justification estimates that this $1.405 billion program is expected to assist 286,108 housing units in FY 2017 at an estimated cost of $4,911 per unit.

are receiving tenant-based rental assistance, and 101 units (0.035%) of the USDA project-based rental assisted housing stock.

As with the preceding sensitivity analyses, the sensitivity of the estimates of the percentages of units for which assistance would be forgone if funding were from HUD or USDA with no appropriation increase, with respect to the range of these assisted housing units which have lead-based paint hazards can be calculated. As shown in Tables 10A and 10B, the percentages of units for which assistance would be forgone under this funding assumption remain relatively small under the high and low assumptions as to the number of housing units with lead-based paint hazards.

Assuming the 2.5th percentile of the confidence interval in prevalence of lead-based paint hazards in government-supported housing units (i.e., 3.0% of such units), 0.020% of units that would have been assisted would not be. Specifically, for public housing, assistance to 0.039% of units would be forgone; for HUD project-based assistance, 0.015%; for tenant-based assistance, 0.014%, and for USDA project-based assistance, 0.009%.

Similarly, assuming the 97.5th percentile of the confidence interval in prevalence of lead-based paint hazards in government-supported housing units (i.e., 21.6% of such units), 0.141% of units that would have been assisted would not be. Specifically, for public housing, assistance to 0.283% of units would be forgone; for HUD project-based assistance, 0.108%; for tenant-based assistance, 0.099%, and for USDA project-based assistance, 0.062%.

Table 10A: Assisted units that would be forgone if funding were from funding agency with no appropriation increase, assuming 2.5th percentile of confidence interval in prevalence of lead-based paint hazards in government-supported housing units

Unit cost activity	Public housing	HUD Project-based	Tenant-based	USDA Project-based	Total
Unit cost of evaluation, and weighted hazard control and temporary relocation for index units	$2,890	$2,890	$2,890	$2,890	-
Est. no. buildings / complexes with child having EBLL	463	364	825	27	1,680
Cost of evaluation, hazard control and temporary relocation in index units	$1,338,486	$1,053,334	$2,384,903	$78,758	$4,855,481

Unit cost of evaluation, and weighted hazard control and temporary relocation for other units	$611	$611	$611	$611	-
Est. no. other units with assisted rental units having child under age 6	1,954	923	696	69	3,642
Cost for other assisted rental units having child under age 6	$1,194,767	$564,138	$425,764	$42,181	$2,226,849
Total cost	$2,533,253	$1,617,472	$2,810,667	$120,939	$7,082,331
Number of units with child having EBLL or other assisted rental units having child under age 6	2,417	1,287	1,522	96	5,322
Program assistance per unit	$5,849.09	$9,013.33	$9,329.09	$4,911.00	-
# assisted units that would be forgone if funding were from funding agency with no appropriation increase	433	179	301	25	938
Assisted housing stock	1,100,000	1,200,000	2,200,000	286,108	4,786,108
% assisted units that would be forgone if funding were from funding agency with no appropriation increase	0.039%	0.015%	0.014%	0.009%	0.020%

Table 10B: Assisted units that would be forgone if funding were from funding agency with no appropriation increase, assuming 97.5th percentile of confidence interval in prevalence of lead-based paint hazards in government-supported housing units

Unit cost activity	Public housing	HUD Project-based	Tenant-based	USDA Project-based	Total
Unit cost of evaluation, and weighted hazard control and temporary relocation for index units	$2,890	$2,890	$2,890	$2,890	- -
Est. no. buildings / complexes with child having EBLL	3,334	2,624	5,941	196	12,095
Cost of evaluation, hazard control and temporary relocation in index units	$9,637,099	$7,584,005	$17,171,303	$567,059	$34,959,466
Unit cost of evaluation, and weighted hazard control and temporary relocation for other units	$611	$611	$611	$611	- -
Est. no. other units with assisted rental units having child under age 6	14,071	6,644	5,014	497	26,225
Cost for other assisted rental units having child under age 6	$8,602,321	$4,061,793	$3,065,499	$303,702	$16,033,315
Total cost	$18,239,420	$11,645,798	$20,236,802	$870,761	$50,992,781
Program assistance per unit	17,405	9,268	10,955	693	- 38,321
# assisted units that would be forgone if funding were from funding agency with no appropriation increase	$5,849.09	$9,013.33	$9,329.09	$4,911.00	-
Assisted housing stock	3,118	1,292	2,169	177	6,757

% assisted units that would be forgone if funding were from funding agency with no appropriation increase	1,100,000	1,200,000	2,200,000	286,108	4,786,108